A journal of the Institute of Corrosion

Corrosion Management

Issue 190 March/April 2026

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The President Writes

Photo: Dr Yunnan Gao.

Dear Members,

Since my last column, the Institute of Corrosion has continued its active programme of engagement across both the UK and the international corrosion community.

Over the past month, I was pleased to attend the ICorr Wales and South-West Branch Annual Dinner, held in Cardiff on 12th February 2026. It was an excellent gathering for the regional corrosion community, where I had the privilege of delivering the opening speech and engaging with branch committee members, colleagues, and our co-host organisation, the Institute of Materials, Minerals and Mining (IOM3). I also had the opportunity to have valuable discussions with the President of IOM3, reaffirming the strong and long-standing collaboration between our two professional institutes. Partnerships such as this remain essential for advancing materials engineering, corrosion management, and professional development across our shared communities. On 17th February 2026, I supported the formal launch of the Institute for Systems Engineering (IfSE) in London, following an invitation. The launch brought together leaders from several Professional Engineering Institutions within the Engineering Council framework. It was a valuable opportunity to interact with fellow presidents and senior representatives from across the engineering sector, exchanging perspectives on how professional institutions can work together to address increasingly complex engineering challenges through interdisciplinary collaboration.

A key highlight during this quarter was my ICorr President's Talk delivered in London on 12th March 2026, hosted by the ICorr London Branch. This biennial address provided an opportunity to reflect on the progress made by the Institute since the beginning of my presidency and to share the direction of our ongoing strategic initiatives. During the talk, I highlighted the many successes achieved by ICorr across both the UK and the international stage. Within the UK, our regional branches have continued to expand their technical activities, networking events, and professional engagement programmes, demonstrating the strength of our volunteer-led structure. Branch events across the country continue to bring together industry professionals, researchers, and early-career engineers to share knowledge and address real-world corrosion challenges. Internationally, ICorr has significantly strengthened its global partnerships over the past year. Our collaboration with organisations such as the Chinese Society for Corrosion and Protection, international engineering institutions, and global corrosion conferences has enabled the Institute to play a more visible and influential role in the worldwide corrosion community. Initiatives such as the UK–China Corrosion Summit and our involvement in major international conferences highlight ICorr's growing contribution to global knowledge exchange and professional collaboration.

The London President's Talk therefore served not only as a reflection on recent achievements but also as an opportunity to encourage continued engagement from our members as we expand the Institute's international reach and professional impact.

I led the ICorr delegation for the AMPP Annual Corrosion Conference and Expo 2026 in Houston US, held from 15th-19th March. This conference remains one of the largest gatherings of corrosion professionals globally, bringing together experts from industry, academia, and research organisations. It provided an excellent opportunity to engage with international partners, exchange ideas, and further strengthen ICorr's presence within the global corrosion community. One of ICorr's flagship international events in 2026 will be the 2nd China-UK Corrosion Summit, which will take place on 12th-13th April 2026 in Beijing, hosted by the University of Science and Technology Beijing (USTB). Jointly organised by the Chinese Society for Corrosion and Protection (CSCP) and ICorr, the summit will feature twelve technical presentations, six from the UK and six from China, highlighting the latest developments in corrosion science and engineering, followed by bilateral meeting, university visit and industry visit on the second day. This event recently posted to all members will provide an excellent platform for professional exchange, collaboration, and networking between corrosion experts from both countries, and I strongly encourage ICorr members to consider attending.

April will also bring two important technical events within the UK. The Cambridge Corrosion Conference 2026, organised by the ICorr Midlands Branch together with the European Federation of Corrosion Working Party 15, will take place on 21st-22nd April in Cambridge. With the theme Digitalisation, AI, and Monitoring in Corrosion, the conference will explore the growing role of advanced technologies in corrosion and integrity management. In addition, the ICorr Corrosion Engineering Division (CED) will host the NetCorr Conference: Corrosion Challenges in CCUS Applications on 24th April 2026, coinciding with our World Corrosion Awareness Day celebration, at the University of Leeds. This one-day conference will bring together experts from industry, academia, and research organisations to examine the integrity challenges associated with carbon capture, utilisation, and storage infrastructure. I am pleased to report that the 2026 Young Engineering Programme is progressing very well, with the first two in-person events already kindly hosted in Manchester by by Mott Macdonald, continuing our efforts to support the next generation of engineers and corrosion professionals.

I warmly welcome you to share your thoughts, insights, and aspirations for the Institute by reaching out to me at **president@icorr.org** Thanks for your continued support, I look forward to seeing many of you at upcoming events and gatherings.

With best regards, **Dr Yunnan Gao, President, Institute of Corrosion, president@icorr.org**

From the Editor

Dear Members,

Welcome to the March–April 2026 issue of *Corrosion Management Journal*, where our theme is Asset Integrity Management (AIM). Ensuring the safety, reliability, and performance of ageing infrastructure remains a key priority across our industry. As assets become more complex and operating conditions more demanding, the need for practical, data-driven integrity solutions continues to grow.

In this issue, we bring together a range of technical contributions that reflect current challenges and emerging approaches in AIM across various industry. We begin with an important article by Dr Chukwuma Onuoha, A Performance-Based Integrity Approach for Non-ILI Assets Using Contactless Magnetic Inspection Technology (CMIT). There are many pipelines which cannot be inspected using conventional in-line inspection (ILI) tools / pigs due to design, operational, or economic constraints. As a result, operators often rely on direct assessment methods such as ECDA, ICDA, and SCCDA. While these methods are well established, they depend on indirect data and engineering judgement, which can introduce uncertainty, particularly for ageing or high-risk assets. The article introduces Contactless Magnetic Inspection Technology (CMIT) as a practical solution for land-based pipelines. This above-ground, non-intrusive method detects disturbances in the Earth's magnetic field caused by defects in the pipeline. It can identify corrosion, stress, and deformation without excavation or interruption to service. CMIT therefore provides more direct and reliable information, supporting better and more confident integrity decisions.

In the Subsea arena, Neil M Cowin has written the article "Advancing Subsea Pipeline Corrosion Inspection, Current Capabilities and Future Requirements" Subsea inspection is very complex and often requires specialised equipment, support vessels, and remotely operated vehicles. Many established non-destructive evaluation (NDE) techniques, such as ultrasonic testing and eddy current methods, are effective but usually require removal of external coatings, which increases cost and operational difficulty. The article also highlights that many subsea pipelines are similarly non-piggable. This creates a clear need for inspection methods that can assess pipeline condition through coatings, including multi-layer and cement-coated systems. Emerging techniques such as pulsed eddy current, electromagnetic methods, thermography, and more recently CT-based approaches show great promise, but further development is needed to make them reliable and practical, especially in deepwater conditions.

Finally, Dr Vijesh Vijayan has contributed the MIC themed article "Internal Corrosion and Biofouling-Driven Degradation in Marine Condenser Vent Piping: A Technical Case Review". This study shows how moisture, stagnant conditions, and microbial activity can combine to cause severe localised corrosion and significant wall loss. It highlights the importance of regular inspection, appropriate material selection, and effective control of biological activity, even in smaller or less components. This issue also features a contribution in our Fellow's Corner by Dr Ahmed Mahgoub (of ICorr CPGB), entitled "Overcoming Plant Isolation Issues within Cathodic Protection Design". Plant facilities often have congested underground systems with multiple metallic structures, electrical grounding networks (for safety reasons), and reinforced concrete, making electrical isolation difficult to achieve and maintain. Dr Mahgoub explains that while galvanic systems may be suitable for simple cases, most plant environments require impressed current cathodic protection (ICCP). However, challenges such as uneven protective current distribution and interference from extensive current draining copper grounding systems must be addressed. The article discusses practical solutions, including the use of mixed metal oxide (MMO) anodes, to achieve effective protection in such conditions.

I hope you find this issue useful and informative. As always, I welcome your feedback and future contributions. Please feel free to contact me on any requirement, at **editor@icorr.org**

Dr Shagufta Khan, FICorr
Editor, *Corrosion Management Journal*

Sarah Bagnall Appointed Chair of the British Stainless Steel Association (BSSA)

Sarah Bagnall, Fellow of Institute of Materials, Minerals and Mining (IOM3) and Chair of ICorr Wales and South-West branch, has been appointed Chair of the British Stainless Steel Association (BSSA).

Sarah, CEng, FIMMM, MICorr, is a Chartered Engineer specialising in materials failure analysis, particularly within the petrochemical, oil and gas, and power industries. She has extensive experience investigating component failures and advising on materials performance across a range of demanding industrial environments.

Prior to her appointment as Chair, she served as Vice-Chair of the BSSA and has been a member of the Association's Board since November 2024. In her new role, she will work to support innovation within the sector and help address key challenges facing the UK stainless steel industry.

Bagnall has been a member of IOM3 since 2011. She is currently Director of Consultancy Services at R-TECH Materials, where she provides technical leadership in materials engineering and failure investigation. Her expertise spans the power generation, petrochemical and construction sectors, where she supports organisations in understanding materials performance, reliability and integrity. She is also the current Vice-Chair of ICorr's Engineering Training Board (ETGB).

Her appointment reflects her significant contribution to the materials and stainless steel community, and her continued leadership within the field.

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R-TECH: **sarah.bagnall@r-techmaterials.com**

ICorr Welcomes New Sustaining Member: OneGarnet

ICorr is pleased to announce that OneGarnet has joined the Institute as a new Sustaining Member.

Photo: OneGarnet Group CEO, Mr Nan Yang (Right) and Global Sales Director Ms. Lily You (Left) with ICorr President Dr Yunnan Gao at MECOC EXPO 2026, Abu Dhabi.

With more than 17 years of specialised experience in garnet mining and processing, the OneGarnet Group has established itself as a global leader in the industry, particularly in garnet resource reserves, processing plant capacity, and automation levels. Its mineral processing technology has received national-level awards and has also been selected for China's 2025 National Science & Technology Major Project - a top-tier national initiative focused on the mineral processing of complex resources. This achievement highlights the recognised technological expertise and innovation within the company.

Supported by high-grade raw ore resources, internationally advanced beneficiation processes, fully automated intelligent production lines, and a rigorous full-cycle quality control system, the OneGarnet product range is widely regarded as industry-leading.

The company has also been very active recently, including the establishment of OneGarnet's subsidiary in Dammam, Saudi Arabia, alongside progressing supplier certification approvals with major oil companies, including Saudi Aramco, ADNOC, and QatarEnergy.

OneGarnet is committed to providing high-grade garnet abrasives and delivering safer, more efficient, and environmentally responsible surface preparation solutions for corrosion protection projects worldwide.

Photo: OneGarnet Abrasive Products in Action.

The company also intends to actively support and promote ICorr activities while contributing to the Institute's continued development and growth.

On Tuesday 28th April 2026, Mr Nan Yang and Ms Lily You of OneGarnet will present to the ICorr Aberdeen Branch, including a practical demonstration of their blasting products.

For further details, please contact Stephanie Okoye, Aberdeen Branch Chair, at **ABZchair@icorr.org** Contacts

Email: **Nan.Yang@OneGarnet.com**

Web: **OneGarnet.com | RZGgarnet.com**

CORREX Updates

It is with sadness and pride that I announce my resignation as CORREX managing director, a role I have held for the last 5 years plus. This is due to the role changing and evolving and taking much more time than it originally did. What with that and being the senior trainer for CORREX, added to that of my normal role as Paintel Technical Director, it has all become too much.

Photo: Retiring CORREX Managing Director – Kevin Harold.

There is good news, however. A new managing director has been chosen and is already in the post, and many of you will know him. He is Mr. Paul Brooks, a fellow member of ICorr and current chair of the London Branch.

Paul comes with huge experience and is a specialist in cathodic protection. Paul and I have been working together these last few weeks to assist in the transition, and he is already proving to be a successful MD. I will continue to support Paul as needed in the new role.

Plus, you don't get rid of me that easily. I will remain the senior trainer for CORREX, so you still have access to me and my knowledge of all things paint and other related topics, even developing new courses as you read this.

Paul and I have already developed a strong working bond, and I look forward to working with him and all of you going into the future.

New CORREX Managing Director – Paul Brooks.

I would also like to add that we finally have a fully working new card system database directly linked to CSCS. This will keep us compliant for years to come, so our affiliation with CSCS is stronger than ever.

With kind regards

Kevin Harold

www.icats-training.org

ICorr Contributes to Parliamentary and Scientific Committee Discussions on Microbial Roles in Environmental Legislation

On Monday, **2nd March 2026**, ICorr participated in the Parliamentary and Scientific Committee (P and SC) meeting at the House of Parliament titled *"How microbes are a crucially overlooked part of environmental and biodiversity legislation"*. The session brought together leading scientists, engineers, academic institutions, and policymakers to examine the increasingly recognised influence of microbial systems across industrial sectors.

Microbial communities underpin a wide range of natural and engineered processes. Their adaptability enables them to thrive in environments spanning the energy sector, agriculture, water treatment and infrastructure, marine and freshwater systems, and the pulp and paper industry, among others. Within the oil and gas sector, specific microbial groups are strongly associated with microbiologically influenced corrosion (MIC) and reservoir souring—both of which carry significant environmental, operational and financial implications. Conversely, beneficial microbial populations offer opportunities for bioremediation, selective anti-souring strategies and potentially microbially enhanced oil recovery (MEOR), supporting improved resource efficiency and environmentalperformance.

This duality formed a central theme of the meeting: microbial ecosystems must be better understood, monitored and integrated into future environmental and biodiversity legislation. Effective policy must recognise both the detrimental impacts of harmful microbial activity and the potential advantages of harnessing beneficial microbial processes.

Discussions throughout the event emphasised the need for more environmentally responsible industrial practices, including the adoption of less persistent, more targeted interventions. Working with microbial diversity—rather than inadvertently disrupting it—was highlighted as essential for long-term operational resilience and the development of modern, science based regulatory frameworks.

Photo: Dr Tony Rizk (ICorr) and Mr Roger Casale (Parliamentary and Scientific Committee) Photographed at the Palace of Westminster.

ICorr remains committed to supporting evidence driven policy development and advancing sustainable, technically robust practices across the corrosion and materials sectors. As microbial science continues to evolve, ICorr will continue to provide expertise to ensure that legislation reflects current understanding and supports innovation in corrosion management.

ICorr Strengthens Global Leadership as Official Supporting Partner at MECOC EXPO 2026, Abu Dhabi

The Institute of Corrosion (ICorr) proudly reinforced its international leadership and strategic influence as an Official Supporting Partner at the 5th Middle East Metallurgy, Corrosion and Coatings Conference and Expo (MECOC EXPO), held from 26th to 29th January 2026 in Abu Dhabi, UAE.

Photo 1: Conference Board Displaying ICorr as An Official Supporting Partner.

Photo 2: ICorr Delegation at MECOC EXPO 2026. L-R: Hooman Takhtechian, Dr Prafull Sharma, Dr Yunnan Gao and Dr Muhammad Ejaz Chair of the UAE Branch.

Formalised through a signed Memorandum of Understanding (MoU), ICorr's role as a supporting partner highlighted the institute's long-standing commitment to advancing corrosion science, asset integrity, and professional excellence across the Middle East and global corrosion community. MECOC EXPO has rapidly established itself as a premier regional platform, bringing together industry leaders, researchers, technology providers, and decision-makers to address critical challenges in corrosion, metallurgy, and protective coatings.

High-Level Representation and Engagement

Upon invitation from the organisers, ICorr President Dr Yunnan Gao attended the full conference and expo programme, including the Opening Ceremony, Closing Ceremony, and multiple technical sessions, engaging extensively with international stakeholders, speakers, and industry leaders. His presence underscored ICorr's strategic intent to deepen collaboration and knowledge exchange within the region.

ICorr's delegation represented a strong cross-section of its international membership and leadership, including:

- Dr Muhammad Ejaz - ICorr UAE Branch Chair (Former ICorr Aberdeen Branch Chair)
- Hooman Takhtechian - ICorr UAE Branch Vice Chair (Former ICorr Aberdeen Branch Chair)
- Amir Attarchi - ICorr UAE Branch Committee Member (Former ICorr Aberdeen Branch Long-Time Committee Member)
- Dr Prafull Sharma – ICorr Midlands Branch Chair.

Together, the delegation actively participated in technical discussions, networking sessions, and strategic exchanges with regional operators, asset owners, regulators, and technology providers.

Recognition of ICorr's Contribution

In recognition of its leadership and support, ICorr was formally presented with the Supporting Partner Award by the Conference Executive Chairman, Juma Al Maskari. This award reflects ICorr's growing global impact, its technical authority, and its commitment to supporting high-quality professional forums that advance corrosion management and integrity assurance worldwide.

Executive Summary - ICorr Exhibition and Outreach

As part of its supporting partner role, ICorr was offered a dedicated exhibitor stand, serving as a focal point for engagement throughout the conference. The ICorr delegation showcased the institute's professional offerings, including membership pathways, training and certification programmes, technical guidance, and global collaboration opportunities.

The exhibition stand attracted strong interest from regional organisations, operators, consultants, and academic institutions, enabling productive discussions on capacity building, professional development, and long-term collaboration across the Middle East and beyond. This engagement further strengthened ICorr's visibility and influence within one of the world's most strategically important corrosion and energy markets.

Thought Leadership in Digital Corrosion Management

A major highlight of ICorr's technical contribution was the panel discussion hosted by Prafull Sharma, titled "Digital Frontiers in Corrosion Prevention: Smart Monitoring, Predictive Analytics & AI Integration."

The session generated lively and in-depth debate, reflecting strong

industry interest in digital transformation, data-driven integrity management, and artificial intelligence applications in corrosion prevention. The discussion was very well received, reinforcing ICorr's role at the forefront of emerging technologies shaping the future of corrosion engineering.

Celebrating Excellence and Professional Achievement

The conference concluded with outstanding recognition for ICorr members and affiliates:

- Dr Muhammad Ejaz, ICorr UAE Branch Chair, was awarded both
  - o Corrosion Specialist of the Year, and
  - o Steel Integrity Strategy Excellence Award, recognising his exceptional professional contributions and leadership.
- Corrosion Radar, employer of ICorr Midlands Branch Chair Prafull Sharma, received the Corrosion Inspection Technology Award, highlighting innovation and excellence in advanced corrosion monitoring solutions.

These accolades reflect not only individual achievement, but also the depth of expertise, professionalism, and global impact of the ICorr community.

Value, Impact, and Lasting Contribution

ICorr's participation at MECOC EXPO 2026 delivered significant value through:

- Strengthening ICorr's global visibility and strategic partnerships
- Promoting professional excellence, innovation, and digital transformation in corrosion management
- Showcasing ICorr's leadership, expertise, and commitment to the Middle East region
- Celebrating and recognising outstanding achievements of ICorr members and affiliates.

Through its active engagement, technical leadership, and recognised contribution, ICorr continues to play a pivotal role in shaping the future of corrosion science, asset integrity, and sustainable infrastructure worldwide.

Photo 3: ICorr President Dr Yunnan Gao (Right 2) at the MECOC EXPO Opening Ceremony.

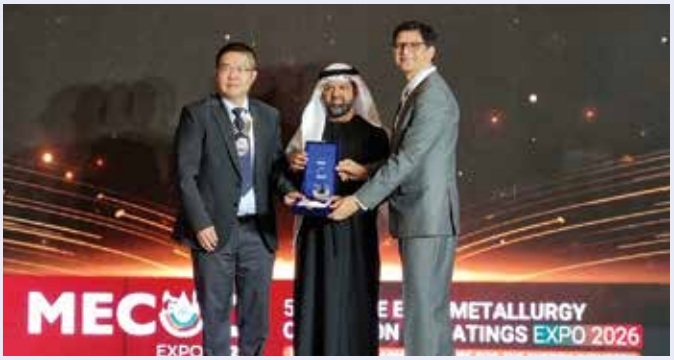


Photo 4: ICorr President Dr Yunann Gao (Left) and ICorr UAE Branch Chair Dr Muhammad Ejaz (Right), Receiving the Supporting Partner Award from Conference Executive Chairman Juma Al Maskari.

Photo 5: MECOC EXPO 2026 Supporting Partner Award Presented to ICorr.

Photo 6: ICorr Delegation at the ICorr Exhibition MECOC EXPO 2026. L-R: Amir Attarchi, Dr Yunnan Gao and Dr Muhammad Ejaz.

Photo 7: Delegates at the Closing Ceremony of MECOC EXPO 2026.

Member & Branch News

ICorr Aberdeen Updates

On Tuesday, 27th January 2026, the Aberdeen Branch held an in-person event at the Palm Court Hotel, with a presentation by Mike Westwood, technical sales engineer at Sand Monitoring Services (SMS).

This successful annual joint event with the Energy Institute (EI) focused on 'Integrated Non-Intrusive Instrumentation for Real-Time Erosion/ Corrosion Monitoring and Management.' This occasion marked Stephanie Okoye's first event as chair of the ICorr Aberdeen Branch, and despite the 'less-than-kind' weather, we were pleased to see a strong and committed turnout. There were 40 registrants and 27 attendees on the night.

About the New ICorr Chair

Stephanie, the newly appointed ICorr Aberdeen Branch chair, is a Chartered Senior Corrosion Engineer with almost 20 years of extensive experience in the oil and gas industry. Her professional expertise encompasses corrosion and integrity management of North Sea oil and gas assets, as well as gas and chemical processing facilities, where she has consistently supported safe, reliable, and efficient operations.

She holds professional certification as a Senior Corrosion Technologist with AMPP (formerly NACE International) and has recently been elected as a Fellow of the Institute of Corrosion (FICorr), reflecting her significant contribution to the corrosion engineering profession and industry leadership.In addition to her technical expertise, Stephanie is a qualified project management professional with a strong track record of successfully leading multidisciplinary teams and delivering complex projects from concept through execution. Her leadership experience, technical depth, and commitment to professional excellence position her well to advance the objectives of the ICorr Aberdeen branch and support the continued development of its members and industry engagement initiatives.

Introduction form the Energy Institute

Dan Byrne from EI enthusiastically spoke about the new structure and work of the Highlands and Islands Branch and their forthcoming programmes. He also stressed the need for institutes to work together to share their knowledge during a difficult period for the UK oil and gas sector.

Further details of their activities may be found at: https://www.energyinst.org/ei-near-me/uk/aberdeen

Photo: Mike Westwood Technical Sales Engineer at Sand Monitoring Services (SMS).

About the Presenter

Mike Westwood is Technical Sales Engineer at Sand Monitoring Services, with over 29 years' experience in the upstream Oil & Gas industry, Mike's current role at SMS includes specialising in real-time non-intrusive erosion / corrosion monitoring instrumentation solutions for asset integrity in challenging environments. With extensive experience supporting operators in corrosion management and erosion monitoring, he advocated for advanced, real-time data systems that enhance decision-making and reduce unplanned downtime. Mike's insights on digital corrosion monitoring underscore his company's transformational role in safety, efficiency, and lifecycle extension of critical infrastructure over the past four decades.

Photo: New ICorr Aberdeen Chair – Stephanie Okoye with Priscilla Ogunlude – New ICorr Internal Secretary.

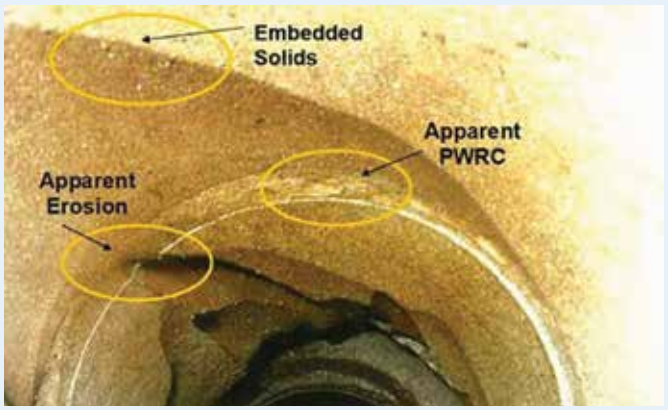


Photo: Example from Choke Failure Impact Assessment.

Synopsis

Across the upstream oil and gas sector, non-intrusive Acoustic Sand Monitoring (ASM) and Real Time Ultrasonic (RT-UT) wall-thickness instrumentation are enabling a step-change in how operators manage corrosion, erosion and overall asset integrity. ASM utilises clamp-on acoustic sensors to quantify sand impact on the pipe wall, defining maximum sand-free or acceptable sand rates so production can be safely optimised while limiting erosion damage at chokes, flowlines and topside equipment. Complementing this, RT-UT provides continuous wall-thickness data at critical locations, delivering early detection of metal loss driven by erosive solids and corrosive service conditions.

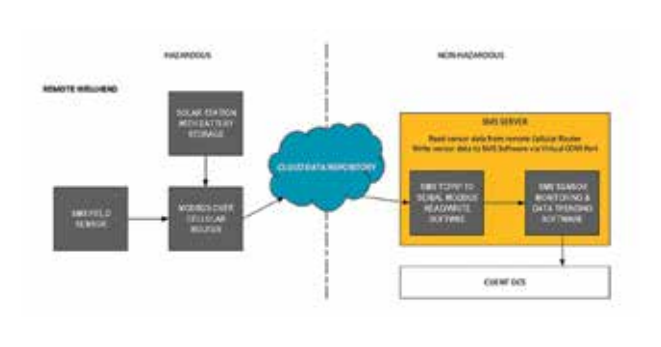


Photo: Example of Remote Sand Monitoring Set-Up.

Deployed together, ASM and RT-UT provide permanent monitoring of both the "cause" (solids production) and the "effect" (resulting wall loss), enabling direct correlation between sand events and measured erosion rates, refinement of predictive models and more robust risk ranking of vulnerable systems. Integrated into a wider sand and erosion management strategy and connected to control systems, these technologies support alarm-driven and automated responses, allowing operators to control sand rates before damage occurs, adopt condition-based intervention planning, defer replacements and minimise loss-of-containment incidents. Their fully non-intrusive, retrofit-friendly design allows installation without process interruption, making them particularly attractive for brownfield assets at risk due to age-related degradation or facing increased solids production due to diminished downhole sand control.

This was a fascinating presentation generating many questions from the joint ICorr/EI audience. Mike highlighted in-service risks and preferred automated solutions to avoid loss of containment and loss of production.

Joint Event Photo: (L-R) Stephen Tate - ICorr Past President, Nigel Owen – Retiring External Secretary, Dan Byrne - EI Branch Vice Chair (Technical Programme), Mike Westwood (SMS), Stephanie Okoye - New ICorr ABZ Chair, Priscilla Ogunlude – New ICorr Internal Secretary and Angela Burnett – EI Vice Chair (Professional Development & Community Engagement).

Future Events

Please contact: **icorrabz@gmail.com** if you wish to join the Aberdeen branch mailing list or contact: **ABZchair@icorr.org** if you wish to join its committee or to make a technical presentation.

All Aberdeen presentations are uploaded at: **https://www.icorr.org/aberdeen/** See local technical programme.

ICorr Central Scotland Branch Updates

ICorr Central Scotland Branch continued its 2025 / 2026 Technical Events Programme in January and February 2026, with presentations from Dr Reza Javaherdashti of the Netherlands and Dr Prafull Sharma of CorrosionRADAR UK, in two hybrid events which were held on **28th January and 25th February 2026**, respectively.

Photo 1: Audience at the January 2026 Technical Event kindly hosted by INEOS, listening to Dr Reza's Presentation (Image Courtesy of Attendees).

January Event

Speaking on the topic "Infrastructure Weakening by Microbial Attack (MIC/MID): Feasibility of post-mortem Analyses, Artificial Intelligence and TRIZ" in January, Dr Reza elucidated the complexity of microbial attack and highlighted the differences between Microbiologically Influenced Corrosion (MIC) and Microbiologically Influenced Deterioration (MID). He explained why MIC occurs rapidly on metallic materials and discussed the timescale of microbial proliferation. Case studies of catastrophic failures were presented to illustrate the insidious nature of microbial attack.

February Event

In February, Dr Prafull Sharma delivered a presentation on the topic "Enhancing Integrity Management through Predictive Analytics – Case Studies on Corrosion under Insulation". This hybrid event was very well attended, with attendees joining online from North America, Asia and Australia, while in-person attendees networked and followed the presentation at the venue at INEOS Grangemouth. Dr Sharma explained the principles of the CUI monitoring technology, delving into the physics of moisture detection and how corrosion rates are determined from what he dubbed "the world's longest corrosion coupon (up to 100m for a single sensor)". He also demonstrated how the technology has been successfully utilised to identify water ingress concerns following insulation application, as well as identifying locations with corrosion under insulation challenges during operations and enabling proactive planning to manage CUI related risks.

Photo 2: (a) Dr Prafull Sharma's Presentation on CUI Monitoring (b), Case Study of Monitoring Applied in Industry (Image Courtesy of Attendees).

Other Central Scotland Branch News

The branch also recently welcomed a new financial secretary, Dr Reza Emad. Reza has been an active member of the branch and brings experience in financial management to the team.

The branch now has five regular event sponsors, boosting its ability to sustain technical events. New sponsors will be appreciated and are welcome.

Following the success of the 2025 technical exhibition *(refer to: CMJ issue 186, July/August 2025)*, a 2nd exhibition is being planned for later in 2026.

The event's details will be published in the Corrosion Management Journal, and a call for exhibitors will be issued in Q2, 2026.

Future Events

Speakers for future events are welcome – please contact the branch with your abstract and presentation topic via **cschair@icorr.org**

ICorr India Updates

The ICorr India Branch has continued its programme of technical activities and knowledge sharing during the early part of 2026. The branch remains committed to promoting professional engagement, technical learning, and collaboration within the corrosion community.

On Tuesday, **20th January 2026**, the branch organised an online webinar titled "Advances in the Technology of Corrosion Inhibitors." The presentation was delivered by Dr Shweta Goyal, Professor and Head of the Civil Engineering Department at Thapar Institute of Engineering and Technology, Patiala, and Vice-Chair of the ICorr India Branch. The talk provided a detailed overview of the development of corrosion inhibitor technology for reinforced concrete.

Photo: Dr Shweta Goyal, Professor and Head of the Civil Engineering Department at Thapar Institute of Engineering and Technology, Patiala, and Vice-Chair of the ICorr India Branch.

Dr Goyal discussed the evolution of inhibitors from traditional inorganic compounds, such as nitrites, to modern organic and environmentally friendly alternatives. Organic inhibitors containing amine,aldehyde and carboxylic functional groups were highlighted for their ability to form protective films on steel reinforcement and reduce corrosion during both the initiation and propagation stages. She also emphasised the importance of two-stage testing, beginning with pore solution studies followed by testing within concrete systems to confirm effectiveness and compatibility. Advanced techniques such as electrochemical impedance spectroscopy (EIS), potentiodynamic polarisation (PDP), FTIR and XPS were presented as valuable tools for understanding inhibitor mechanisms.

The talk also highlighted recent developments in sustainable corrosion protection. Amino acid–based inhibitors were discussed as promising eco-friendly solutions capable of mitigating corrosion in chloride and carbonation environments. In addition, smart corrosion inhibitors and microencapsulation technologies were presented as emerging approaches that allow inhibitors to be released only when corrosion or cracking occurs. The Bidirectional Electromigration (BIEM) technique was also introduced as a hybrid method combining chloride extraction with inhibitor injection for improved durability of reinforced concrete structures.

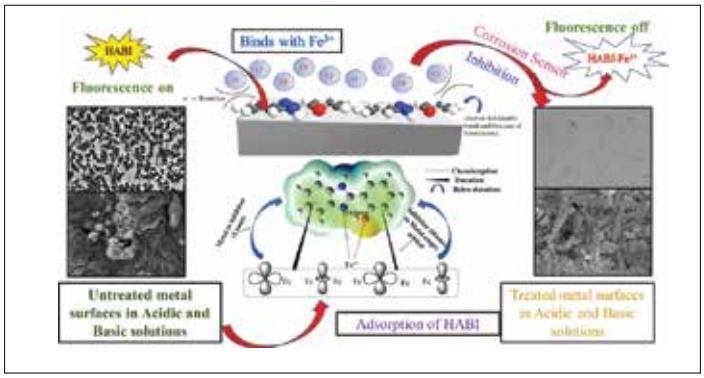


Figure: Process of Inhibition.

On **Tuesday 17th February 2026**, the branch hosted another technical presentation titled "Beyond Monitoring: Leveraging AI and Digital Twins for Predictive Corrosion Resilience," delivered by Dr G. H. Thanki **https://shethgroupofindustries.com/dr-g-h-thanki/**

The presentation explored how artificial intelligence and digital twin technologies are transforming corrosion management by moving from reactive maintenance to predictive and data-driven strategies.

Photo: Dr G H Thanki – CorroSafe Principal Corrosion Management Consultant.

Dr Thanki explained how the integration of IoT sensors, physics-based models and advanced analytics can create digital twins that simulate asset behaviour and predict corrosion risks. These technologies allow asset owners to anticipate degradation and take preventive action before failures occur.

He noted that corrosion costs the global economy an estimated USD 2.5 trillion annually, while also contributing significantly to environmental impacts due to the need to replace damaged infrastructure and materials.

The presentation highlighted the benefits of digital twin–based corrosion management, including potential reductions of 30–40% in maintenance costs, 25% extension of asset life, and significantly faster inspection processes.

Dr Thanki also discussed future developments such as multimodal AI combining sensor, imaging and documentation data, intelligent coatings with embedded inhibitors, and advanced simulations for designing corrosion-resistant materials.

Stay Connected

To stay informed about ICorr India Branch activities and technical programmes, follow us on LinkedIn:

https://www.linkedin.com/in/institute-of-corrosion-india-branch-india-branch-ab3003379/

For branch-related queries, please contact:
INDIAchair@icorr.org

ICorr London Updates

For the second branch technical meeting of 2026, Nick Bander of GPT Industries presented "Critical Service Isolation: Why Yesterday's Designs Fail Today" on **12th February 2026.**

Nick Bander is the director of engineering and product management at GPT Industries https://www.gptindustries.com/ with over 15 years of experience in mechanical engineering, corrosion mitigation, and pipeline integrity. Nick has supported domestic and international energy projects across more than a dozen countries and has played a key role in the development and launch of multiple isolation and sealing technologies. A named inventor on several patents, he focuses on translating engineering rigour into practical, field-proven corrosion control solutions.

Photo: Nick Bander, Director of Engineering and Product Management at GPT Industries Presenting.

Nick began by explaining how pipeline operating conditions are becoming increasingly more severe, with higher pressures and temperatures, more sour and conductive media, stricter safety requirements, and reduced tolerance for downtime. These changes are placing new demands on electrical isolation systems used for corrosion mitigation on critical service pipelines. The designs that were once adequate are now being pushed beyond their intended limits.

The presentation then examined why isolation design and specification are more important than ever, and Nick reviewed the evolution of isolation technologies and highlighted common failure mechanisms observed in laboratory and field conditions, including GRE permeation, chemical incompatibility, hydrolysis, loss of bolt load, fire exposure, and conductive media bridging. The key design factors such as material selection, gasket geometry, and inside-diameter sealing strategies were discussed in detail.

Photo: London Vice Chair - Ashokan Gopal Presenting ICorr Pen to Nick Bander.

In conclusion, the lessons learned were highlighted to help improve the reliability, safety, and long-term performance of pipeline isolation systems operating in today's demanding environments, and Nick gave some practical design guidance.

This was an interesting talk which generated a lively discussion, and as is usual, Nick was presented with an ICorr pen as thanks for his presentation by Ashokan Gopal, the branch vice chair.

For more information about London branch events, please see the ICorr website: **https://www.icorr.org/ and https://www.icorr.org/events/**

For London Branch updates and enquiries contact: **londonchaire@icorr.org**

London Branch AGM

The branch held its AGM on 12th March, when the current chair, Paul Brooks, gave an overview of the branch's activities for the last year. The accounts were presented by the treasurer, Jim Glynn, which showed the branch had a very successful year and that more than £6k (£1k more than the allocation) was returned to Head Office. These were proposed and agreed.

Paul stood down as chair, and Ashokan Gobal was proposed as chair, together with the existing committee, which was accepted by the meeting. The committee is now:

Chair: Ashokan Gopal

Vice Chair: Berenyka Syrek-Gesterkornf Treasure: Jim Glynn

Secretary: Anthony Setiadi

Committee members: Brian Goldie, Ennery Leon, Chiara Sorrentino, Alejandra Fernandez-Vinas and Paul Brooks

There was a discussion about members attending the technical talks and whether to go to a hybrid event or do more events rather than talks. The committee agreed to look into these suggestions at their next meeting.

Photo: Dr Yunnan Gao.

The AGM was followed by a talk from the ICorr president. Yunnan described the current set-up and operation of the institute and its various operations, including the national and international growth, developments across the events programme, and the institute's newly awarded licence status with the Engineering Council – an important milestone in strengthening ICorr's professional framework. He then outlined the upcoming events in which the institute was playing a major part, for example, the 2nd China-UK Corrosion Summit in Beijing, China, hosted by the University of Science and Technology Beijing (USTB).

For more information about London branch events, please see the ICorr website or contact the branch at, **londonchaire@icorr.org**

ICorr North-East Updates

Christmas Social – Darts Night

A successful social evening was held on 28th January in Newcastle. This was a delayed Christmas event and was attended by twelve people who had a few rounds of darts followed by some refreshments.

Photo: ICorr North-East Committee – Darts Social Evening.

ICorr NE Branch, Christmas Dinner

The branch committee got together to enjoy a Christmas dinner in Newcastle upon Tyne and celebrate our successes in 2025.

Committee Members

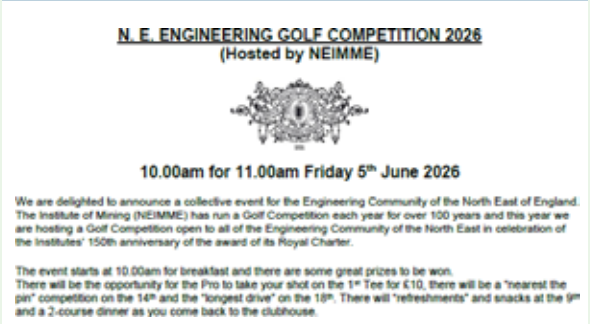
There have been some changes to the NE Branch Committee with Rob Marsden, Paula Harevey, and Lev Leviev joining the committee to help run the branch. During 2026 we will hold AGM and confirm official positions; at present Matt Fletcher remains as chair and Josie Watson as treasurer.

Additional Branch E-Mail Address

You will notice that general communications from the NE Branch will come from a different email address, **NEBranch@icorr.org** – the **nechair@icorr.org** remains for direct communication with the Chair.

Northern Engineering Societiess

Of interest is work being done to unite activities of the Northeast Engineering Societies. ICorr NE Branch is engaging in this. The first event being a golf day on **5th June 2026** in Newcastle upon Tyne, to be followed by a conference arranged by EngTog (Engineering Together - **https://engineeringtogether.com/**) in Teesside on **26th September 2026** with further events planned.



N. E. ENGINEERING GOLF COMPETITION 2026
(Hosted by NEIMME)

10.00am for 11.00am Friday 5th June 2026

We are delighted to announce a collective event for the Engineering Community of the North East of England. The Institute of Mining (NEIMME) has run a Golf Competition each year for over 100 years and this year we are hosting a Golf Competition open to all of the Engineering Community of the North East in celebration of the Institutes' 150th anniversary of the award of its Royal Charter.

The event starts at 10.00am for breakfast and there are some great prizes to be won.
There will be the opportunity for the Pro to take your shot on the 1st Tee for £10, there will be a "nearest the pin" competition on the 14th and the "longest drive" on the 18th. There will "refreshments" and snacks at the 9th and a 2-course dinner as you come back to the clubhouse.

For further information please see:
https://mininginstitute.org.uk/events/golf-tournament/

ICorr North-West Updates

NW Branch held its AGM at the Mott MacDonald office in Central Manchester on **20th January 2026.**

The Committee elected the following roles:

- **Chair:** Izabella Gajewska (starting in March)
- **Vice Chair:** Jane Lomas
- **Secretary:** Alyshia Keogh
- **Treasurer:** Chris Atkins

Photo: Izabella Gajewska – New NW Branch Chair.

Remaining committee members are to continue in their present roles.

Ben Hudson from Premtech - **premtech.co.uk** gave an excellent talk on the Young Engineer Programme (YEP) and his experience of working on the case study.

Members, including coatings and CP experts, attended and have been mailed by the chair to say thanks and that we welcomed their event ideas, with various away days given as options.

Greg Brown stood down and said "what a pleasure it had been to chair the branch for the past 5 years and that he was just fortunate that the branch had such a good committee."

The NW committee offer their thanks for all Greg's past support and guidance. Research showcase events are planned for the spring in partnership with Leeds Uni / Yorkshire Branch.

Photo: Greg Brown – Retiring NW Branch Chair.

Mott MacDonald is hosting the YEP lecture programme this year at its Piccadilly Gardens, Manchester offices and the initial events with Jane Lomas and Paul Lambert have proved very successful.

Branch meetings for the year will be finalised when handover to the new Chair is complete and will be posted to: **https://www.icorr.org/events/** Anyone wishing to attend or get involved should contact **nwchair@icorr.org**

ICorr South-West Updates

The Inaugural CorMat Dinner Brings Corrosion and Materials Professionals Together

On **12th February 2026**, a new milestone for collaboration across the corrosion and materials communities with the inaugural CorMat Dinner—an initiative jointly organised by the Wales and South-West Branch of the Institute of Corrosion and the Newport & Cardiff Materials Society (NCMS). The evening brought together professionals from across disciplines for an engaging night of networking, knowledge-sharing, and community building.

The event represented more than simply a dinner; it signalled a renewed commitment to strengthening the links between corrosion specialists and materials scientists—two closely connected fields that benefit greatly from collaboration. By creating a shared forum for conversation, the CorMat Dinner aims to encourage the exchange of ideas, foster professional relationships, and promote cross-disciplinary learning within the engineering and materials sectors. The evening attracted a diverse group of attendees, including engineers, researchers, industry specialists, and early-career professionals. Conversations flowed easily as participants discussed emerging technologies, practical challenges in corrosion management, and opportunities for collaboration across academia and industry. The relaxed atmosphere, paired with excellent food and lively discussion, created the ideal setting for both professional engagement and social connection.

The organisers were particularly honoured to welcome two distinguished guests whose presence underscored the significance of the event. Among them was Yunnan Gao, President of the Institute of Corrosion, whose leadership continues to champion the advancement of corrosion science and professional development within the field. Also in attendance was Christine Blackmore, President of the Institute of Materials, Minerals and Mining (IOM3). Their participation helped highlight the importance of strengthening connections between professional institutions and technical communities.

Both guests expressed their support for initiatives that bring together professionals from related disciplines. In industries where materials performance and durability are critical—from infrastructure and energy to manufacturing and transportation—the integration of corrosion expertise with broader materials science knowledge is essential. Events like the CorMat Dinner provide an important platform for encouraging these conversations. The success of the evening was the result of the hard work and enthusiasm of the organising teams from both societies. Their efforts ensured that the event not only ran smoothly but also created a welcoming and engaging environment for all attendees. The strong turnout and positive feedback demonstrated a clear appetite within the community for more opportunities to connect in this way.

Beyond the professional discussions, the evening also reminded attendees of the value of informal networking. Some of the most valuable insights and collaborations in engineering arise not only from conferences and technical papers but also from the conversations that happen around the dinner table. By bringing people together in a relaxed setting, the CorMat Dinner helped strengthen relationships that may well lead to future partnerships, projects, and innovations.

With such a successful launch, the organisers are hopeful that this inaugural gathering will become the first of many. The vision is for the CorMat Dinner to evolve into a regular event that continues to bring together corrosion and materials professionals from across the region and beyond.

If the enthusiasm of the first evening is any indication, the CorMat Dinner has already established itself as a valuable new addition to the professional calendar, one that celebrates collaboration, community, and the shared goal of advancing materials performance and corrosion management.

Photo: Delegates Networking and Enjoying the Inaugural CorMat Dinner.

Photo: L-R: Sarah Bagnall, Chair of the Wales & South-West Branch of the Institute of Corrosion; Fiona Robinson of the Newport & Cardiff Materials Society; Christine Blackmore, President of the Institute of Materials, Minerals and Mining (IOM3); and Yunnan Gao, President of the Institute of Corrosion.

Stay Connected

The Wales and South-West Branch deliver a diverse technical programme. Future events will be posted at: **https://www.icorr.org/events/**

To join, or to present to the branch, please contact: **swchair@icorr.org**

You can also keep up to date on events by visiting its LinkedIn page; **https://www.linkedin.com/groups/12992293/**

ICorr Yorkshire and the Humber Updates

The Yorkshire and Humber branch are making plans for 2026 following their successful relaunch event and AGM on **20th November 2025**, with several events already taking shape. The committee has been working closely with neighbouring branches and industry partners to create a range of events for the year ahead.

One of the most exciting developments is a joint effort with the North-West Branch and Young ICorr to organise a dedicated student research event. This event aims to strengthen academic connections between the University of Leeds and the University of Manchester, providing a platform for research students to showcase their research and network with industry professionals.

Photo: Dr. Joshua Owen - Branch Chair.

In addition to academic engagement, the branch is also preparing to deliver two industry-focused technical events in partnership with leading companies in the region. The first will be hosted with **Ionix** - **https://ionixadvancedtechnologies.co.uk/** focused on their advanced corrosion detection technologies, while the second will be held with **Corrocoat** - **https://www.corrocoat.com/** to offer members insight into the latest advancements, case studies, and practical applications in protective coatings and corrosion control solutions. Full details, including dates, venues, and speaker announcements, will be released in the coming weeks at: **https://www.icorr.org/events/**

Dr Joshua Owen is the newly appointed Chair of the Yorkshire and Humber branch and may be contacted at: **yorkshirechair@icorr.org**

Corrosion Around Us

Photo: Spotted recently at Preston Railway Station, severely degraded coatings to Overhead Platform canopies, requiring urgent Fabric Maintenance.

INSTITUTE OF CORROSION

Advancing Corrosion Science & Engineering.

ICorr Corrosion Engineering Division (CED)

NetCorr – Corrosion Challenges in CCUS Applications

Friday, 24 April 2026 (Corrosion Awareness Day 2026)
09:30 – 16:30 (UK)
Bragg Centre for Materials Research
University of Leeds, Woodhouse Lane, Leeds, LS2 9JT

- **Limited to 60 delegates**
- **Lunch and refreshments included**
- **Tours of University of Leeds Corrosion Labs and Facilities**
- **Exhibition space available (tables + banner)**

Event Overview

Carbon Capture, Utilisation and Storage (CCUS) is central to achieving Net Zero targets. However, the deployment of dense phase CO_2 transport and storage networks introduces significant corrosion and integrity challenges.

This one-day technical conference will explore:

- CO_2 impurity reactions and acid formation
- Specification realism vs operational reality
- Corrosion testing challenges and methodology development
- Lessons from CCS network operations and design
- Modelling, autoclave testing, and full-scale validation

The event brings together operators, consultants, researchers, and testing specialists to examine the "big picture" corrosion challenges in CCUS infrastructure.

Register today

to secure your place – limited spaces available and filling quickly.

Institute of Corrosion - CED Conference - CCUS Challanges

REGISTER NOW

Young ICorr Committee Report

Overview

The Young ICorr Committee has continued to build momentum over recent months, working closely with partners across the Institute and the wider industry to deliver impactful initiatives for earlycareer corrosion professionals. While our primary focus has been on the Young Engineers Programme (YEP), significant progress has also been made on professional development activities and plans for upcoming events throughout 2026.

Photo: Kathy Purnell, YICorr Chair.

Photos: YEP 2026 Launch with Jane Lomas and Alyshia Keogh.

Skills for Corrosionists Series

On **14th January 2026** we launched the first session of our new *'Skills for Corrosionists'* training series—an online initiative designed to address the clear need for soft-skills development among those in the early stages of their corrosion careers. Delivered in collaboration with the Midlands branch, this initial session was run deliberately as a pilot but received excellent engagement and positive feedback.

The session featured an in-depth presentation from **Prafull Sharma**, who discussed entrepreneurship in practical and accessible terms, offering insights that strongly resonated with attendees.

Building on this success, a second session is scheduled for March, focusing on **marketing and personal branding.** This upcoming event is planned in collaboration with **Young EFC**, enabling wider international participation and extending the programme's reach across Europe.

We welcome recommendations for potential speakers from within the ICorr community as this series continues to grow.

Young Engineers Programme (YEP) 2026

The Manchester launch of YEP 2026 on **29th January 2026** marked one of our most significant achievements this period. Despite several last-minute withdrawals due to external funding constraints, strong applicant numbers meant the programme was still able to run at full capacity by drawing from the waiting list.

Hosted at **Mott MacDonald** and supported by the North-West branch, the launch brought together a diverse cohort of early-career engineers from various sectors and countries—demonstrating the international demand for structured development pathways within the corrosion field.

Participants were introduced to the programme's objectives, structure, and expected outcomes, followed by the first training module on corrosion fundamentals, led by **Jane Lomas - FOCE - Institute of Corrosion.**

Early feedback has been overwhelmingly positive, with several participants already engaging with regional ICorr branches, joining Young ICorr activities, and even applying for free student membership following the event.

We are most grateful to our current sponsors and hosts:

bp

MOTT MACDONALD

AMPP
The Association for Materials Protection and Performance

To secure the long-term growth of YEP, we are actively engaging with other potential sponsors throughout 2026 and would welcome any leads or recommendations. This represents a significant opportunity for organisations to demonstrate their commitment to **social responsibility, earlycareer development, and the future of the corrosion industry.** Companies interested in contributing to this impactful initiative are encouraged to reach out for more information at: **youngicorrchair@icorr.org**

continues on page 20

Visit the YICorr website for all the latest news www.icorr.org/events/

March 2026 Update

The Young Engineers Programme (YEP) continues to demonstrate exceptional momentum this year, with excellent attendance throughout the sessions and consistently positive feedback from participants. This strong engagement shows the value the programme brings to early-career professionals seeking to build their knowledge and confidence within the corrosion management field.

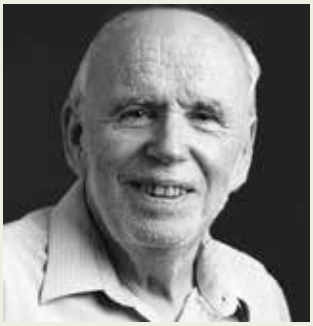


Photo: Paul Lambert who spoke on Materials Selection.

Recent sessions delivered by **Jane Lomas** and **Paul Lambert** (26/02/26) have been particularly well received. Participants praised the clarity, depth, and practical relevance of their content, which has significantly enriched this year's learning experience. We are also pleased to announce that the **case study for this year's cohort has now been selected.** This represents a significant milestone in the programme, and we look forward to revealing the chosen theme in the coming months. The case study remains a core element of YEP, providing a structured opportunity for participants to apply their learning in a collaborative, real-world context while guided by world-class mentors, the winning candidates being rewarded with a visit to **AMPP27.** Again, our sincere thanks go to **BP, Mott MacDonald, AMPP** and **ICorr** for their continued support of the programme. Their involvement has been central to the success of YEP so far, and we look forward to building on this strong foundation in the coming months. We look forward to continuing the programme's strong progress and to the exciting sessions still ahead.

Additional Activities

Alongside these core initiatives, the committee continues to advance several important workstreams:

Collaboration with Young EFC

We are developing joint initiatives, including activities linked to **Eurocorr** - Eurocorr 2026 with planned contributions to the **Women in Corrosion** and **Careers** events, as well as extending the Skills for Corrosionists series across Europe.

YICorr Mentorship Programme and Awards

Significant development is underway for both the mentorship scheme and the Young ICorr Awards. These initiatives will undergo wider promotion later in the year as we move toward launch.

Student Engagement

We remain actively involved in supporting and delivering the student seminar series in partnership with the **North-West** and **Yorkshire & Humber** branches, helping to encourage new entrants into the corrosion community. The committee remains committed to strengthening relationships across the wider ICorr network and fostering meaningful collaboration with local branches. Through shared initiatives, training programmes, and student outreach, we continue to support the next generation of corrosion professionals and build a thriving, connected community.

Upcoming Events and News

Future YICorr and YEP events will be posted at:
https://www.icorr.org/events/

To join YICorr, or to present please contact: **youngicorrchair@icorr.org**
You can also keep up to date on events by visiting its LinkedIn page:
YICorr | LinkedIn

YEP Journeys – Diary Reflections from AMPP Nashville

Editor's Note: **We are pleased to have the opportunity to publish the 4th of our series of dairies from the YEP 24 winners.**

Corrosion, Sustainability and Communication at AMPP 2025 – Amy Johnstone

My name is Amy Johnstone, and I work in the offshore structures team at Kent. Originally graduating as a mechanical engineer in 2017, I worked in various mechanical engineering and technical advisory roles before starting my current job as a structural engineer in May 2023. Over this time, I began to work more and more on materials and corrosion scopes, including my current role as a materials and corrosion engineer on the Berwick Bank and Mona and Morgan offshore wind farms. All that means is I get to work on a rich variety of interesting projects, but that I panic a bit when people ask me what sort of engineer I am. I applied to the Institute of Corrosion's Young Engineers Programme because I wanted to delve a bit deeper and back up my on-the-job learning by picking up where my Chemistry GCSE left off.

After a year-long programme of lectures and mentoring, I was delighted when my team won the award for best case study

presentation and the opportunity to attend the AMPP 2025 Conference and Expo. One of the key themes I noticed cutting across a wide variety of technical presentations was how corrosion engineers can support sustainability objectives. In the following sections, I will delve into just two of the many insightful technical presentations and panel discussions which were in one way or another related to this topic.

Photo: Amy Johnstone, Structural Engineer at Kent.

ILife Cycle Check of Anode Alloys for Cathodic Protection of Marine Energy Infrastructure [1]

Lisbeth Rischel Hilbert – Associate Partner, IPU

Every product or asset that engineers may work on has a wide range of localised and remote impacts on the environment during extraction, manufacturing, installation, use and disposal. A Life Cycle Assessment (LCA) may be used to assess and quantify these impacts [2]; however, thecomprehensiveness required to produce a good LCA means that it can be unwieldy and difficult to complete if there are several unknowns. A Life Cycle Check (LCC) methodology has been put forward as a lighter touch alternative to an LCA, following the same principles but targeting the check towards limited areas of interest to inform decision-making.

In this presentation, Lisbeth Hilbert presented IPU's work using an LCC methodology to compare two different aluminium anode alloys given in ISO 9351:2025 [3], alloys "A3" and "A5". A key difference between the two is that A5 has a lower zinc content than A3, 0.3% to 0.8% mass fraction compared to 4.75% to 5.75%. In the marine environment, toxicity of materials to the surrounding ecosystem is a key concern and therefore an important facet to consider in the LCC. Studies such as Ebeling et al. 2023 [4] have shown that metal emissions from galvanic anodes on offshore structures can be found in the surface sediments in the surrounding environment. As offshore wind is set to play a key part in a transition to a more sustainable energy system, initiatives such as the Anemoi programme [5] have been set up to better understand these effects of metal emissions and the available mitigations. Another dimension of sustainability examined in the LCC was Global Warming Potential (GWP). This is a complex measure that depends greatly on extraction, manufacturing and transportation methods. To illustrate this, a comparison was made between the same anode for use in a North Sea wind farm, manufactured in either Brazil or Iceland, which clearly showed the benefits to GWP from siting manufacturing in places with a higher proportion of renewables in the energy mix and reducing transportation distances.

Overall, the A3 anode, with higher aluminium content, showed a slightly higher global warming potential than the A5 anode. However, the A5 anode, with higher zinc content, showed a higher toxicity. This demonstrates the need for professional judgement when making decisions about sustainable materials selection. However, adopting the use of an LCC on engineering projects provides a clear, efficient and traceable methodology for informing those judgements. Moreover, while environmental scientists are essential in creating LCC tools and datasets, making these tools available to materials and corrosion engineers would promote the incorporation of sustainability objectives into day-to-day project decisions.

A Pan-Industrial View of Material Sustainability & Material Stewardship Practices

Panel Discussion

One of my favourite parts of the conference was the discussion that took place after the presentations on material sustainability and stewardship practices across multiple industries. One insight that stuck with me was the observation that corrosion engineers and climate scientists are often faced with the same challenge. Whether putting forward the case for investment in climate change action or corrosion control, our message is "act now so that nothing will happen". If our recommendations are not followed and corrosion damage/climate chaos ensues, then we may be able to turn around and point out where we think things went wrong. However, if our recommendations are followed and nothing happens, then people may quite reasonably ask whether we really need to invest all that money and make significant changes to commonly accepted practices just to maintain the status quo. In my own day-to-day work, I am quite often one of a handful of materials and corrosion engineers on a project with around 50 structural engineers, geotechnical engineers, safety engineers and project managers. In that kind of environment, I've had to become multilingual, speaking the language of fundamental materials and corrosion science, broader engineering concepts, risk assessment and financial impact.

To that end, the ICorr Young Engineers Programme was a masterclass in effective communication. I would recommend that any early-career engineer participate in the programme if only for the experience of presenting your analysis of an engineering problem and your proposed solution as you would to a client, manager or research director.

Corrosion Engineers Just Do Nothing

I'd like to thank the Institute of Corrosion and my excellent mentor, Ali Morshed, for the opportunity to participate in the Young Engineers Programme and to attend the AMPP conference in Nashville. And, as the conference was in Music City, I'd like to leave you with a quote from one of my favourite bands, the Talking Heads. If corrosion engineering is all about working hard to make sure that nothing happens, then "it's hard to imagine that nothing at all could be so exciting.

Photo: YEP 2024 Winners celebrating in Nashville for AMPP25.

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2. A Gathorne-Hardy, Newcomer's Guide to Life Cycle Assessment – Baselines and Boundaries, RGTW Working Paper No. 3, 2015.
3. ISO 9351:2025 – Galvanic Anodes for Cathodic Protection in Seawater and Saline Sediments, 1st edition, International Organization for Standardization (ISO), 2025.
4. S Ebeling et al., "Investigation of Potential Metal Emissions from Galvanic Anodes in Offshore Wind Farms into North Sea Sediments", Marine Pollution Bulletin, Vol. 194, 2023.
5. ANEMOI Project, Interreg North Sea Programme, available at: https://www.interregnorthsea.eu/anemoi/ (accessed 5 June 2025).

Corrosion in Infrastructure:

The Glasgow M8 Woodside Viaduct Repairs

Dr Shagufta Khan, Editor, CMJ and Stephen Tate, ICorr Immediate Past President

Introduction

Corrosion-related deterioration of major transport infrastructure continues to pose significant safety, operational and financial challenges across the United Kingdom. Few projects illustrate this more vividly than the ongoing refurbishment of the **M8 Woodside Viaducts** in central Glasgow — a complex engineering task that has attracted national attention due to its scale, cost, technical difficulty and prolonged impact on one of Scotland's busiest motorway corridors.

Constructed between 1969 and 1971, the twin elevated viaducts at Woodside carry approximately **150,000 vehicles daily** through the densest urban section of the M8 motorway. They form a critical link between junctions 16 and 17 near Charing Cross, bridging tightly constrained city streets, long-established residential areas, and Glasgow's historic subway tunnels.

When extensive corrosion damage was discovered in 2021, particularly to the **reinforced concrete crossheads** supporting the decks, an immediate programme of lane restrictions and emergency propping was introduced to ensure continued safe operation. The scale of deterioration, combined with constant environmental exposure, ageing materials, and multiple layers of historic modification, has since led to a multi-year project of unprecedented complexity. Costs have risen from an estimated £81 million to between **£126 million and £152 million**, while the completion date has shifted from 2023 to the **second half of 2027.**

This article summarises the historic context of the viaducts, the corrosion and structural challenges identified, the bespoke engineering solutions implemented, and the wider lessons for long-term asset integrity management of the UK's post-war transport infrastructure.

Photo: The Twin Elevated Woodside Viaducts Between Junctions 16 and 17 of The M8 Through Glasgow - a Critical Transport Artery Now Undergoing Major Corrosion Related Repairs, Image Courtesy of Transport Scotland.

Background: Completing the North Flank of Glasgow's Inner Ring Road

The Woodside Viaducts form part of the ambitious **Glasgow Inner Ring Road**, a post-war urban motorway system planned in the 1940s and formalised in the 1962 *Interim Report on the Glasgow Inner Ring Road*. Delivered by Scott Wilson Kirkpatrick and Partners, the north flank — including Townhead Interchange and the Woodside Section — was among the most technically ambitious civil engineering works undertaken in Glasgow in the late 1960s.

Construction of Woodside motorway section progressed in **two stages:**

Stage 1 (1967–1968)

Connected Townhead Interchange to Craighall Road.

- Included distributor roads, pedestrian routes, and major alterations to surface streets.
- Integrated American-style elements such as Botts' Dots (tactile lane markers), reflecting the influence of US freeway design.
- Prepared foundations and approach routes for the elevated viaducts to be built in Stage 2.

Stage 2 (1969–1971)

Created the twin multi-span **Woodside Viaducts,** 365 m and 460 m long.

- Utilised **precast, post-tensioned concrete beams**, up to 80 tonnes each, to maintain traffic flows on surface streets during erection.
- Included seven road bridges, two footbridges, two underpasses and eleven retaining walls.
- Introduced advanced pre-casting techniques and a dedicated casting yard, achieving up to 12 beams per week.

The viaducts were engineered for a 50-mph design speed and projected traffic flows of **100,000 vehicles** per day — a volume vastly exceeded today.

Widening Works of the 1990s

By the early 1990s, traffic congestion on the north flank had reached unsustainable levels. Strathclyde Regional Council initiated a widening scheme that added an additional running lane in each direction between Townhead and St George's Cross.

At Woodside:

The **westbound viaduct** was significantly widened.

- Abutments were reconstructed and hard shoulders removed in sections.
- New supports and pier modifications were introduced.
- Ramp metering was introduced at J16 in a UK first.
- The design accommodated space originally reserved for future M8 connections.

These works altered load paths, increased carriageway capacity, and added new structural elements - all of which significantly complicate today's repair strategy, especially where old and new materials interact under environmental exposure.

Structural Investigations: Deterioration Revealed (2020–2021)

Routine inspections in late 2020 and early 2021 revealed worrying signs of structural degradation, prompting more detailed testing.

Key findings included:

1. Severe deterioration of concrete crossheads

These reinforced concrete elements sit atop the piers and support the precast beams.

- **Chloride-induced corrosion** of steel reinforcement was extensive.
- Concrete cracking, spalling and section loss were discovered.
- Freeze–thaw cycling exacerbated deterioration, particularly on exposed edges.
- Saturation due to long-term water ingress had accelerated the damage.

Photo: Crosshead Deterioration Between Beams M8 Woodside Viaduct, Image Courtesy of New Civil Engineer and Transport Scotland.

Photo: Reinforced Crosshead Deterioration at Deck Edge Eastbound Carriageway M8 Woodside Viaduct, Image Courtesy of New Civil Engineer and Transport Scotland.

2. Water ingress and salt contamination

Decades of exposure due to:

- De-icing salts used in winter had created a highly aggressive environment for both steel and concrete.
- Leaking drainage channels.
- Rainwater run-off from the deck.

3. Load-carrying capacity concerns

Finite element modelling and physical testing indicated that the worst-affected crossheads were no longer provided margins of safety required for 150,000+ daily vehicles.

4. Immediate safety actions

In March 2021:

- Plans for temporary propping were accelerated.
- Restrictive traffic management was introduced.
- Several slip roads were closed.
- The M8 was reduced from **four lanes to two** in each direction.

The deterioration was more severe than historic records predicted, partly due to a lack of accurate information about hidden structurally relevant elements and services together with the ageing nature of the structures.

Corrosion Mechanisms: Understanding the Root Causes

The degradation at Woodside is a case study in long-term corrosion processes affecting post-tensioned concrete infrastructure.

Chloride Ingress

- Road salts had penetrated the concrete cover over five decades.
- Chlorides de-passivated the steel reinforcement.
- Localised pitting corrosion had occurred, affecting flexural capacity (ability to resist bending stresses).

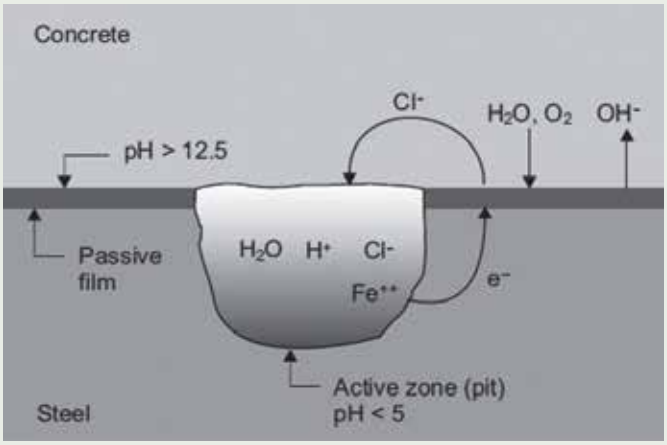

Figure: Chloride Induced Pitting Reinforced Concrete, Image Courtesy of CTL Qatar.

Water Ingress

Persistent leaks (through poor maintenance) and saturated concrete created an ideal environment for corrosion.

Carbonation

Although not the primary deterioration mechanism, carbonation also lowered local pH and weakened concrete at exposed edges.

continues on page 24

Hidden Defects from 1960s Construction

Common to many 1960s infrastructure assets that are now reaching the end of their design life.

- Historic concrete mixes, workmanship variations, and the use of early post-tensioning systems all contributed to long-term vulnerability and risk of failure in service.

The Repair Strategy: Temporary Steel Propping Systems

To ensure public safety while permanent repairs were developed, engineers adopted an extensive temporary works strategy involving bespoke **steel propping at 23x locations.**

Design Challenges

Each propping location required a unique solution because of:

- Confined urban spaces.
- Differing pier heights and geometries.
- Interaction with sensitive public utilities.
- Poor or incomplete historic documentation.
- Proximity to Glasgow's **subway tunnels.**
- The discovery of an **uncharted sewer,** which forced redesign and replanning.
- Variable ground conditions

Construction Approach

Each propping location required a unique solution because of:

1. **Excavation and piling** began in August 2021.
2. High-level steel structures were built to surround and bypass the weakened crossheads.
3. Props were installed progressively from February 2022 onwards.
4. Heavy-duty steel frames transferred live loads away from damaged concrete to the new supports.
5. Propping allowed engineers to undertake investigation, strengthening and reconstruction works without removing the viaduct from service.

Complexity and Safety

This remains one of the most intricate civil temporary-works projects ever undertaken in Scotland.

The bespoke nature of the props, complicated interfaces with buried utilities, and need to maintain motorway operation above and city street access below have significantly extended the construction timeline.

Traffic Management and Urban Constraints

The Woodside Viaducts sit in one of the most constrained transport corridors in Scotland. Key challenges included:

- Accommodating diversions through narrow Victorian streets.
- Avoiding disruption to the **transport tunnels,** which run beneath the structure.
- Ensuring safe pedestrian routes near schools and residential areas.
- Maintaining movement for 150,000+ vehicles per day.
- Preserving access beneath the viaduct for residents, businesses and emergency services.
- Working alongside major utility networks (water, gas, power, telecoms).

A new slip road at Junction 17 was constructed to improve westbound traffic flows. Diversions via St George's Road, Garscube Road and West Graham Street have been essential to maintain operational capacity.

Cost Escalation and Programme Delays

The project's rising costs and extended schedule reflect its unique challenges:

- Original estimate: **£81 million.**
- Revised estimate (2024): **£126–£152 million.**
- Initial completion date: **late 2023.**
- Current projected completion:
  - **Eastbound reopening:** Autumn **2026.**
  - **Full completion (Westbound):** Second half of **2027.**

Reasons for escalation include:

- Complexity of designing **23x bespoke propping systems.**
- Discovery of an uncharted deep sewer.
- Extended traffic management requirements.
- Global supply chain and material price volatility.
- Interference with buried utilities.
- Need for additional strengthening once deterioration.
  was fully mapped.
- Unexpected ground conditions.

Progress to Date (as of August 2025)

- **13 of 23x** propping locations had been completed.
- Significant strengthening works were underway.
- Permanent repair solutions were being finalised.
- Eastbound viaduct projected for reopening in 2026 and Westbound to follow in 2027.
- Structural health monitoring and inspection access.
  improvements have been planned.

Photo: One of 23x Temporary Props Required for Repairs to M8 Woodside Viaduct, Image Courtesy of ALAMY.

Lessons for UK Infrastructure and Asset Integrity

The Woodside Viaduct project offers wider lessons for the UK's post-war transport infrastructure.

1. Improved Structural Health Monitoring (SHM)
Permanent SHM systems should be installed on major elevated structures to detect early signs of deterioration.

2. Accurate Records are Essential
Historic discrepancies in utility and structural records have caused major delays and redesigns.

3. Concrete Crossheads are Vulnerable
Many 1960s–70s viaducts use similar reinforced concrete supports and are now approaching end-of-life.

4. Climate and Urban Pollution Accelerate Corrosion
Increasing rainfall*, higher ambient temperature, more frequent heatwaves, de-icing salt use and air pollution can all intensify reinforcement corrosion.

* The average rainfall in Scotland between 2010-19 was 9% wetter than the 1961-90 average.

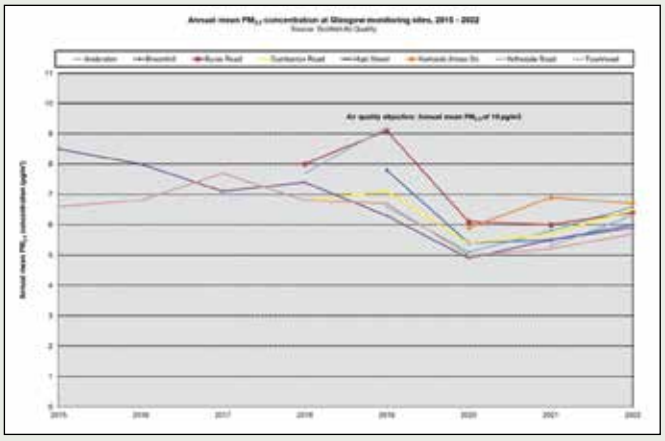

Figure: Annual Mean PM2.5 Concentration at Glasgow Monitoring Sites 2015-2022 (Source: Scottish Air Quality).

Forecasts for peak' summer temperatures range from 28°C (1980-2010) to 32°C (2050s) and by the 2070s will reach 34°C.

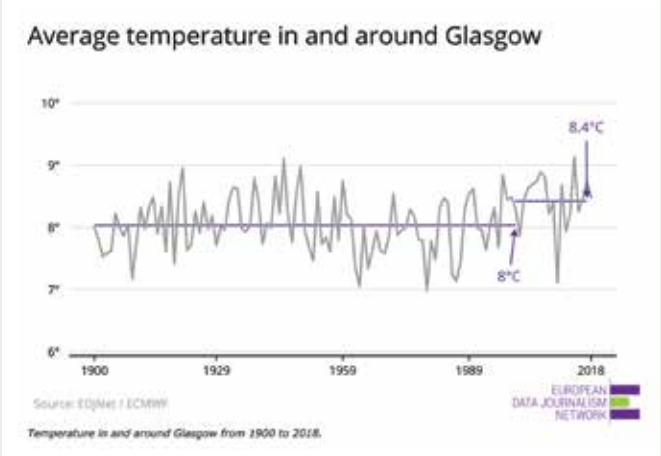

Figure: Temperature Data for Glasgow M8 Routing (Source: European Data Journalism Network).

5. Temporary Works must be Considered in Lifecycle Planning
Large-scale propping operations can cost tens of millions and extend programme durations by years.

6. Multi-Disciplinary Coordination is Critical
Urban viaduct repairs require enormous planning and collaboration between civil engineers, corrosion specialists, transport planners, utility companies and local authorities.

Summary

The Glasgow M8 Woodside Viaducts refurbishment is one of Scotland's most complex and significant corrosion-related infrastructure projects in recent decades. Built in the late 1960s and heavily modified in the 1990s, the viaducts have suffered extensive deterioration driven by chloride ingress, water penetration and long-term environmental exposure.

The discovery of severe crosshead deterioration in 2021 triggered lane restrictions and a multi-year emergency propping programme involving 23x bespoke structures.

Complicated interfaces with utilities, subway tunnels and densely built-up streets, combined with escalating material costs and discovery of an uncharted sewer, have pushed costs to above £150 million and moved completion to 2027. Alongside this, there was a significant campaign mounted to remove the previous scar through the city left by the building of the urban motorway and to restore lost residential areas and parkland.

Despite all of these challenges, the project is now advancing steadily. Once completed, the viaducts will have renewed structural capacity, enhanced durability and improved inspection access — securing the long-term future of a critical component of Scotland's motorway network.

As with the past refurbishment of Edinburgh's North Bridge featured in Corrosion Management July/August 2025 corrosion_management_issue186lo-res.pdf this project serves as a timely reminder of the importance of planned maintenance, accurate records, modern corrosion and structural monitoring systems, and proactive asset management for the UK's ageing civil infrastructure.

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ICorr Training: CPGB – Improving our Candidate Experience

Overall, 2025 was a very strong year for the CP Training Scheme, running 32 courses with high course occupancy rates, nevertheless we have identified a range of improvements that shall be implemented from 2026 onwards to strengthen further our position.

We are currently seeking additional tutors for Concrete and Marine Application Sectors in 2026. We have also identified our first Overseas Tutor for commencing courses in KSA, who is a member of CPGB and an ISO 15257 Level 4 ICorr CP certificated Aramco Engineer. Courses in KSA should enable candidates from Libya, Algeria and the Gulf countries to attend who would otherwise struggle to obtain UK visas.

Photo: Ben Magee, Chair of CPGB.

In addition to the requirement to update the course notes to better serve international audiences, we are also addressing now concerns about the quality of the course notes and course presentations more generally and looking to align them better with industry requirements.

Further, we have recently completed an internal audit of examination paper structures across application sectors, and a more uniform approach to examinations is being devised and implemented, which should ensure candidates are examined more robustly.

Facility wise, a new Marine CP teaching site at the Port of Blyth is now in planning. The intention is to use the facility to target the Renewable (Offshore Wind) market both in Europe and the UK. There is also the potential to target ROV Operators with a potential future Level 1 Marine course. This will compliment our two UK-based Training Centres at Telford (Fressyinet) for Marine, Concrete and Buried courses and Argyll Ruane at Sheffield [also teaching our Buried courses].

There remains the possibility of opening a further future facility in Aberdeen, subject to demand. However, the Port of Blyth is currently the preferred option for development.

Please contact Ben Magee, CPGB Chair who can assist with any further queries. Email: cpgbchair@icorr.org

ETGB Corner – Expanding our Training Portfolio

ETGB Corner – Chair's Opening Remarks

In this issue, I'm pleased to share an update on our ongoing work to strengthen and expand ICorr training portfolio. High quality, industry relevant training remains central to our mission, and the ETGB continues to focus on developing programmes that support both the profession and the wider civic community.

This month, we are delighted to introduce two courses. The first is *Corrosion Mechanisms in Stainless Steel*, a joint, focused and technically rich programme designed to deepen understanding of stainless steel behaviour across a range of industrial environments. The second is the newly reviewed Corrosion at Home and Its Prevention course, scheduled for rollout in Q3 of 2026. This updated version reinforces our commitment to making corrosion awareness accessible to the wider public, helping individuals make informed decisions and enhance safety in everyday settings.

We are also keen to broaden participation in course development. There is a valuable opportunity for experienced corrosion professionals to share their knowledge and help shape future training modules. Equally, we encourage young engineers, scientists, and those pursuing chartership or continuing professional development (CPD) to engage with these programmes as a way of strengthening their technical foundation and advancing their careers.

As always, the ETGB remains committed to delivering training that reflects the highest standards of professionalism, relevance, and technical excellence. We look forward to continued collaboration across the community as we build the next generation of corrosion-related learning.

For anyone interested in developing a corrosion-related course or registering for upcoming training, please contact Dr Tony Rizk at ETGBChair@icorr.org

Joint Corrosion Mechanisms in Stainless Steel

The *Corrosion Mechanisms in Stainless Steel* course offers a structured, practical overview of stainlesssteel behaviour in service and the reasons failures arise. The programme begins with key metallurgy and corrosion principles, then examines the mechanisms most commonly encountered in industry, including tea staining and rouging, general corrosion, pitting and crevice corrosion, selective attack, galvanic corrosion, chloride and caustic stress corrosion cracking, polythionic acid SCC, hydrogen-induced cracking, high-temperature corrosion, microbial corrosion, corrosion under insulation (CUI), erosion corrosion and corrosion fatigue.

For each mechanism, the course outlines how degradation develops, the critical environmental and material factors, how to recognise damage in service, and which grades are most susceptible. Typical plant locations and practical mitigation measures are also covered.

Who Should Attend: Engineers, designers, manufacturers, fabricators, buyers, sales teams, distributors, maintenance and inspection personnel, and quality engineers seeking deeper insight into stainlesssteel performance in demanding environments.

CPD Certification: Participants receive a CPD approved certificate confirming completion and learning in stainless steel corrosion mechanisms and mitigation.

The course is delivered in collaboration with RTECH and the British Stainless-Steel Association. The next session will be held on **8th October** in Birmingham, with additional dates available from mid-May.

Corrosion at Home and its Prevention

Many people assume corrosion is simply "something we have to live with," but understanding this natural phenomenon is important. Corrosion can lead to:

- **Health concerns** (e.g., contaminated water from corroded plumbing)
- **Financial losses** (repairing or replacing damaged items)
- **Aesthetic deterioration** (rust stains, tarnished surfaces, degradedequipment)
- **Reduced functionality and safety** (motor vehicles)

The good news is that with the correct choices, corrosion **can be controlled,** and often prevented, with simple, practical steps. Even basic household chemicals and a bit of common sense can go a long way in maintaining the quality, appearance, and performance of everyday items.

That's why we're developing **"Corrosion at Home and Its Prevention"**, a new awareness course designed to make corrosion science approachable and useful for everyone. The course is now at an advanced stage and has been crafted to support:

- **STEM - School and student programmes**
- **Community groups**
- **Public awareness programmes**
- **Anyone interested in protecting their home and belongings**

Our aim is to empower people with knowledge that saves money, improves safety, and reduces waste, all while making science engaging and accessible.

More details will be shared soon by our growing Institute of Corrosion (ICorr). Corrosion may be everywhere, but with the right understanding, it doesn't have to be a problem.

INSTITUTE OF CORROSION

Registration Now Open:
ICorr MIC Training Course 12th–16th October 2026

Advance your organisation's capability in microbial corrosion management with this high impact, ICorr training programme. Designed for professionals in operations, integrity, inspection, management, design, R&D, consultancy, and utilities.

The course equips participants to:

- Identify MIC drivers across a wide range of systems
- Implement targeted monitoring, mitigation, and control strategies
- Lead investigations supported by robust, defensible evidence
- Influence organisational policies and strengthen MIC governance
- Align internal practices with global standards and best-in-class methodologies

Delivered by a leading subject matter expert and aligned with ICorr recognised competency framework, this course blends technical depth with practical application—empowering participants to protect assets, enhance performance, and drive meaningful organisational improvement. It contributes to Continuing Professional Development (CPD).

Certification Opportunity

Participants who successfully pass the final examination will earn the **ICorr Certified MIC Technologist credential**—a globally recognised mark of excellence in microbial corrosion management and a valuable step toward professional chartership.

- Venue: ICorr HQ, Northampton, United Kingdom
  For further information: Dr Tony Rizk – ETGBchair@icorr.org
- Registration: admin@icorr.org

Registration Now Open: ICorr FOCE (MICorr) Training Course

14th–18th September 2026

Advance your ICorr Professional Membership

This industry leading course provides direct access to professional membership of ICorr, for those with relevant experience. Corrosion management, failures and remediation commonly occur throughout all branches of engineering where metals are part of the structure or process. FOCE is a corrosion course that covers the basic principles of corrosion that are needed by engineers to understand why and how failures occur, actions that can be taken to manage the ongoing corrosion and/or remediate the structure, and options to prevent further corrosion, where possible. The course is presented as a series of modules, starting with essential background information about the corrosion process and then applying the basic principles to common engineering metals, including stainless steel, aluminium, and copper alloys. Both the general and the different types of localised corrosion such as crevices, pitting, bi-metallic corrosion, etc., is considered. Common atmospheric and immersed conditions, re-bar in concrete, high-temperature atmospheres, water treatment, buried pipes, etc are considered to understand corrosion.

Corrosion management strategies, including material selection, cathodic protection, surface preparation, coatings, chemical treatments, inhibitors, etc., are included in the course. The role of the corrosion engineer is described and includes investigation of failed components, inspection, and testing of samples, with practical examples and case histories included in the course notes.

As a classroom-based course, FOCE is provided in English by an experienced, practicing corrosion consultant. A copy of the training material is provided to each attendee. Questions and active participation are encouraged throughout the course, as many participants enjoy learning about the additional real-life examples that are provided by fellow attendees. Fun quizzes are held each morning so both the candidates and the tutor can assess their progress during the week on an ongoing basis. One-on-one sessions can be arranged where a student has a specific module requirement.

The learning modules are given over four intensive days, and candidates for the examination on the final day are encouraged to revise the material each evening to ensure that they understand the course content. At the end of the course, all attendees are given a Certificate of Attendance, which shows that they have been present for all the modules. After passing the examination, participants receive a Certificate of Achievement, which demonstrates that they have received sufficient corrosion training to apply directly. Previous attendees of the course have ranged from complete beginners in corrosion (zero previous knowledge) to practicing Corrosion Consultants.

Certification Opportunity

Participants who successfully pass the final examination will receive certification towards MICorr Professional Membership and contributes to Continuing Professional Development (CPD).

- Venue: ICorr HQ, Northampton, United Kingdom
  For further information: Dr Jane Lomas – ETGBchair@icorr.org
- **Registration**: admin@icorr.org

STGB Report - Introducing Our New Surface Treatment Scheme Manager (STSM) – Grant Wright

The Institute is pleased to announce the appointment of Grant Wright as Surface Treatment Subject Matter Expert and Scheme Manager (STSM). Grant joined us on 1 March 2026 and has recently completed a handover period with Jane Lomas, who is retiring from the role.

Grant brings over 30 years of experience in protective coatings and passive fire protection (PFP). He began his career as an apprentice spray painter before progressing into industrial coatings and metal preparation. Early in his career he worked within the family coatings business, followed by roles covering both automotive and industrial coatings. He subsequently gained 13 years of experience in the energy industry. Grant has extensive hands-on experience and views surface treatment as a complete science, extending far beyond the application of paint. In recent years he served as the focal point for Stork Technical Services on Dana Triton Asset before moving to the role of Fabric Maintenance (FM) Manager for Sonomatic UK projects.

Based in Motherwell, Scotland, Grant currently serves as technical FM lead within KAEFER's Energy Division, where he leads his own team of Level 3 inspectors. Grant has also been progressing through the Institute's Engineering Council (EngC) professional registration scheme, supported by Vice President Anthony Setiadi. He initially achieved Incorporated Engineer (IEng) status and is now working towards Chartered Engineer (CEng).Following completion of ICorr training courses and joining the Institute as a TICorr member, Grant progressed to MICorr membership and is now aiming to achieve FICorr in the near future.

Grant is also a valued member of the reformed STGB committee, which has recently been driving a number of key improvements within the institute's surface treatment training scheme. He can be contacted in his new role at **STSM@icorr.org**

Photo: New STSM – Grant Wright, MICorr, ICorr Coatings Level 3, ICorr PFP Level 3, ICorr Insulation Level 2, Rope Access Level 3, TTP Trainer.

We wish Grant every success in his new responsibilities.Although stepping down as STSM, Jane Lomas will continue to support ICorr through her work on the Council and by delivering her Fundamentals of Corrosion course, with the support of Tony Risk, ETGB Chair. Her next course is scheduled to run from 14 to 18 September 2026.

For course registration or to enquire about other ICorr training courses, please contact admin@icorr.org

Industry News

Industry News from ICorr Corporate and Sustaining Member Companies

Bilfinger Secures Offshore and Onshore Maintenance Contracts in the UK

Bilfinger has secured two significant maintenance contracts in the UK, strengthening its presence across both offshore and onshore energy infrastructure. The awards include work on the Cygnus gas field for Ithaca Energy and a fabric maintenance contract at the SAGE Terminal in St Fergus with Wood plc.

The first contract covers Access and Fabric Maintenance Services for Ithaca Energy's Cygnus assets. The Cygnus gas field is the UK's largest producing gas field and plays a key role in supporting national energy security. The development comprises three bridge-linked Alpha platforms and connects to the Bacton Gas Terminal, operated by Perenco.

The field also includes Cygnus Bravo, an unmanned satellite platform located around 7 km northwest of Cygnus Alpha. The contract follows Ithaca Energy's acquisition of Eni's UK upstream oil and gas assets in 2024, which added the Cygnus field to its North Sea portfolio. In a second award, Bilfinger will deliver Fabric Maintenance and Access Support Services at the SAGE Gas Terminal under a contract with Wood plc. The three-year agreement marks a return for Bilfinger to the strategically important site and further strengthens its operational footprint in the region.

As part of the project, Bilfinger will introduce product and digital innovations to support continuous improvement. This includes consolidating operational data onto a digital platform, introducing new corrosion protection products, and leveraging group-wide capabilities for prefabricated insulation solutions.

Sandy Bonner, President Western Europe at Bilfinger, said the contract wins reinforce the company's strong position in the UK energy sector and highlight the value of its integrated services model for customers operating critical infrastructure.

Source: https://www.bilfinger.com/en/

Hempel Completes First Successful Applications of Hempaguard NB on Maersk Newbuild Vessels

Hempel has completed the first successful applications of its next-generation silicone hull coating, Hempaguard NB, on newbuilding vessels for A P Moller – Maersk. The milestone demonstrates that advanced silicone coatings can be integrated into the newbuilding process, helping shipowners achieve improved performance and lower environmental impact from the outset.

The first vessel to receive the coating was Tangier Mærsk, the lead ship in a new series of six 9,000 TEU container vessels ordered by Maersk. The coating was applied in October 2025 at Yangzijiang Shipyard in China through close collaboration between the shipyard, Maersk and Hempel's technical teams.

The successful application represents an important step in extending the proven performance of the Hempaguard coating system to vessels directly from the shipyard. Despite being the first application of Hempaguard NB during vessel construction, the work was completed efficiently without affecting the vessel's launch schedule. This demonstrates the coating's suitability for integration into standard shipyard workflows.

According to Hempel, the project confirms that advanced silicone hull coatings can be applied during newbuild construction when coating specialists, shipowners and shipyards work closely together. The approach enables shipowners to benefit from optimised hull performance and improved energy efficiency from the first day of operation, while shipyards can enhance their offering by integrating innovative coating technologies into their construction processes.

Following the initial application on *Tangier Mærsk*, two additional vessels in the same newbuilding series were successfully coated with Hempaguard NB in January 2026. The project partners view the results as a significant achievement, demonstrating the potential for wider adoption of silicone coatings in newbuild programmes.

Building on these successful trials, further vessels under the same contract are scheduled to receive the Hempaguard NB coating during 2026, reinforcing the growing role of advanced coating technologies in improving vessel efficiency and sustainability across the maritime sector.

Source: https://www.hempel.com/

Other Industry News

Protal™ Liquid Epoxy Coatings Celebrate 40th Anniversary: 1986 – 2026

Winn & Coales (Denso) Ltd [WCD] an ICorr gold sustaining member, along with parent company Winn & Coales International Ltd [WCI], leading manufacturer and supplier of corrosion prevention, waterproofing and sealing products, proudly commemorates the 40th anniversary of its Protal™ range of liquid epoxy coatings.

Offering excellent gouge, abrasion and impact resistance, this moisture tolerant pipeline coating was reformulated to comply with both EU and UK laws regarding the manufacture and supply of chemical substances, in addition to offering improved brushing characteristics for the user during application. The product is approved for use by the UK's multinational utilities company and features in their National Grid Coatings Register in multiple product groups (9, 9c and 10).

As of 2026, Protal's popularity continues to endure, establishing itself as the go-to solution for pipeline and critical infrastructure protection due to its ease of use, durability, and excellent substrate adhesion and coverage.

WCI Group Chair, Chris Winn, said, "As we commemorate forty years of Protal™ liquid coatings, we celebrate a journey defined by innovation and resilience. This milestone underscores our unwavering commitment to advancing corrosion prevention technologies and providing solutions bearing a name that our customers know and trust.

Winn & Coales (Denso) Ltd has been creating bespoke and off-the-shelf solutions that provide enduring protection against corrosion for over 95 years. For further information about Protal Liquid Coatings, or any of their other products, visit their website at www.denso.net

Email: Rickey Carter rcarter@denso.net

IGS Awarded GCC LNG Contract for Sour Service Pipe Remediation

The project will see rapid deployment of HVTS® technology to internally clad 700+ metres of carbon steel pipe, avoiding costly shutdown at one of the world's most advanced LNG production facilitiest.

4th February 2026: Integrated Global Services (IGS), asset integrity solutions for energy infrastructure, has been awarded a contract by a major GCC LNG producer to deliver corrosion mitigation and pipe upgrades for finger slug catcher systems at one of its largest facilities. The work will help to safeguard the performance and reliability of mission-critical equipment at one of the world's most strategically important LNG sites.

The work has been awarded to deliver a solution for severe internal corrosion in the finger slug catcher system, with sections of 48-inch diameter carbon steel piping severely deteriorated, risking plant shutdown. With replacement of pipes not an option within the turnaround timeframe, IGS has been selected to rapidly deploy its proprietary nickel-based High-Velocity Thermal Spray (HVTS®) cladding for pipes in combination with Corrosion-Resistant Alloy (CRA) weld overlay at field joints.

This solution is designed to enable rapid restoration, long-term asset reliability, and the potential to save hundreds of millions of dollars in lost production from avoidable downtime. To overcome restricted internal access associated with large-diameter piping, IGS is also deploying semi-autonomous technology, using remotely operated vehicles to perform internal grit blasting, quality control inspection, robotic overlay and HVTS® application deep inside the pipe work. These advanced techniques enhance safety by minimising human intervention, ensure repeatability and provide precision cladding in previously inaccessible geometry, while enabling a continuous corrosion barrier to be installed with limited uptime interruption.

The news comes amid the Middle East's natural gas sector on a rapid growth trajectory, with production in the next four years set to increase by 30% to meet growing demand for power. As a result, asset integrity and production continuity are under the spotlight, with ginger slug catcher systems playing a central role in protecting downstream equipment and maintaining stable gas processing operations, particularly in harsh, sour gas environments where internal corrosion can rapidly escalate to unplanned shutdown risk. The contract win for IGS is now in its first phase of delivery, and the project will see 700+ metres of new carbon steel pipe internally clad with HVTS®, representing 3400 m^2 total coated surface area, alongside in-situ protection of existing pipework with internal cladding.

IGS' integrated integrity solution is designed to stop further internal metal loss, extend asset life, and reduce the risk of containment loss. The scope includes 100% internal visual inspection and detailed cladding thickness mapping, delivering full traceability and confidence in barrier performance.Project mobilisation began in Q4 2025 and IGS crews have been active on site through January 2026, completing in-field works and preparing for the next phase of execution.

Learn more at https://integratedglobal.com/

Energy Sector Greenfield Milestone: Aramco and CorrosionRADAR Set New Benchmark for Data-Led Asset Integrity Management

Wednesday 11th February 2026: Aramco, the world's largest energy company, is expanding its partnership with CorrosionRADAR, global solution provider for CUI risk monitoring, as it deploys the company's predictive CUI monitoring solution at a major new greenfield project in Saudi Arabia.

The solution - which delivers continuous, remote detection and monitoring of Corrosion Under Insulation through data-led insights and AI-optimised software - is being installed at scale across the new facility, providing clear visibility of asset conditions from the very outset of the project.

Installing the solution at the design stage will provide significant benefits to Aramco, including improved CUI management planning, substantial cost savings, and extended asset lifetime.

Connected by CorrosionRADAR's Clarity software, which uses predictive analytics models, machine learning and AI, to deliver insights for faster, more confident decision-making, a substantial number of assets will be monitored for localised corrosion and moisture ingress.

Showcasing the collaboration at the 19th Middle East Corrosion Conference and Exhibition (MECOC) in Saudi Arabia, representatives of the Aramco Greenfield Project Management Team (PMT) highlighted how they are embedding CorrosionRADAR's solution during the Front-End Engineering Design (FEED) stage of the project and implementing it at the site during the Engineering Procurement and Construction (EPC) stage. This is leading to smarter design choices, CAPEX savings in the shorter term and OPEX savings in the medium term, transforming Aramco's approach to CUI management and setting a new benchmark for asset integrity.

A PMT representative said: *"With Corrosion Under Insulation accounting for significant pipeline maintenance costs in some of our facilities, it poses a serious threat to the future success of this development. To address this, we are working closely with CorrosionRADAR to deploy its predictive CUI monitoring solution throughout the Greenfield project from Day One. This approach will ensure we achieve continuous CUI visibility, improved asset integrity, and, most importantly, greater operational efficiency[1] There was also a recent presentation by Aramco PMT at the Middle East Corrosion Conference."*

During his keynote opening speech at the 19th MECC, Ahmad O. Al-Khowaiter, Executive Vice President of Technology & Innovation at Aramco, highlighted the value CorrosionRADAR is already delivering across the company's operations. He explained that with CUI being one of being one of the most persistent and expensive challenges across all industries - billions of dollars in savings can be realised just by embedding AI and other corrosion control technologies into long-term asset strategies.

Dr Chiraz Ennaceur, Chief Executive Officer and Co-Founder at CorrosionRADAR, said: *"Our latest project with Aramco is an important example of how embedding a CUI monitoring solution across a facility from the outset, will have a transformative impact on long-term asset strategies and maintaining asset health. By prioritising data, machine-learning and predictive strategies over reactive ones, Aramco will be able to detect early indicators of corrosion and take informed action against any damage – improving safety, reducing costs, and enhancing operational efficiency. We look forward to working alongside Aramco and the wider industry to continue to advance CUI management practices and help set new global standards for the future of asset integrity."*

CorrosionRADAR is the global solution provider for CUI risk monitoring, combining the power of data, product, and expertise for the highest quality prediction of when and where corrosion will occur. It's solutions use data analytics software to monitor and predict risk remotely, allowing businesses to make data-driven decisions about their industrial assets, saving time and money, while enhancing safety and ensuring the longevity of critical infrastructure.

For additional commentary, interview requests or further information about CorrosionRADAR, please contact info@corrosionradar.com and www.corrosionradar.com

Fellow's Corner

This series of articles is intended to highlight industry-wide engineering experience, guidance and focussed advice to practising technologists. It is written by ICorr Fellows who have made significant contributions to the field of Corrosion Management.

Overcoming Plant Isolation Issues within Cathodic Protection Design

Dr Ahmed Mahgoub, FICorr

INSTITUTE OF CORROSION

Meet the Author

Dr Ahmed Mahgoub

Dr Ahmed Mahgoub is cathodic protection subject matter expert for Saudi Arabian Oil Company (Saudi Aramco) in Dhahran, Saudi Arabia. He has more than 19 years of experience in the consulting, engineering, constructing and commissioning of different cathodic protection structures. He is a an AMPP CP Specialist, ICorr CP specialist, Fellow of ICorr, ICorr CPGB Member and AMPP Snr. Corrosion Technologist.

Introduction

Cathodic protection (CP), when applied properly, is an effective means to prevent corrosion of underground plant piping. For many underground applications, such as pipelines, CP system design is relatively straightforward. Plant and facility environments, however, are not simple applications. Plants have congested underground piping systems such as process drains and other utilities in a tightly spaced footprint. The presence of copper grounding systems, foundations with reinforcing steel embedded in concrete, conduit, utility piping and structural pilings (either bare or concrete with reinforcing steel) can greatly complicate the task of designing a pipe CP system.

For simple plant facilities, it is possible to isolate the piping and utilise a conventional galvanic corrosion prevention system. This works only if the plant piping is electrically isolated from other underground structures for the life of the facility. For most plant and facility applications, it is not practical to isolate the piping from the grounding system for the life of the facility. In these cases, an impressed current cathodic protection (ICCP) anode system is the only alternative as a galvanic system does not normally have sufficient capacity to overcome plant earth connections. This paper represents the linear mixed metal oxide (MMO) anodes, which in suitable conditions can be an optimal method of providing adequate CP protection criteria as specified in [1-4] to the piping network in crowded areas of oil and gas plants.There are two conventional approaches to cathodically protecting underground plant piping using impressed current anodes - deep vertical anode bed and shallow / distributed anode bed. However, there are three principal industry challenges to consider for any CP system within a plant and described as shortages in utilising a conventional ICCP system.

- First is the current distribution issue due to highly congested underground environment that is common to most plants.
- The second critical factor is isolation in the presence of a pervasive copper grounding network, often applied for safety reasons to protect rotating equipment and security fences.
- Third is the probability of DC interference due to stray currents from multiple sources.

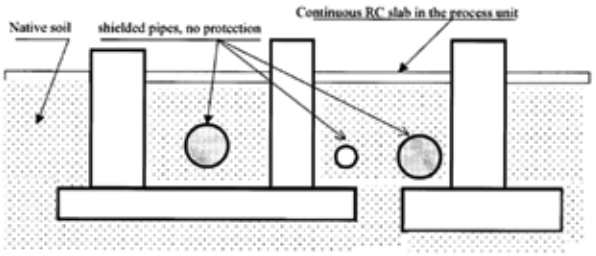

Figure1: A Typical Process Piping Layout Where Reinforced Concrete Foundations are Restricting The Flow of Protective Current.

MMO System

The linear MMO Anode is a long-line, flexible, cable-like anode, which is placed in continuous close proximity to (typically 0.5m to 1m from) the piping network. In conditions of similar backfill/resistivity, uniform distribution of CP current is therefore achieved on applications where many conventional anodes ground beds do not work or would cause excessive interference. In contrast to conventional anode ground beds CP systems, Linear MMO Anode is placed in the ground parallel and in close proximity to the plant piping to be protected and provides uniform distribution of protective current to the entire steel surface as demonstrated in various studies [4-9], thereby maintaining the steel-to-soil "instant-off" potential in the required protection criteria.

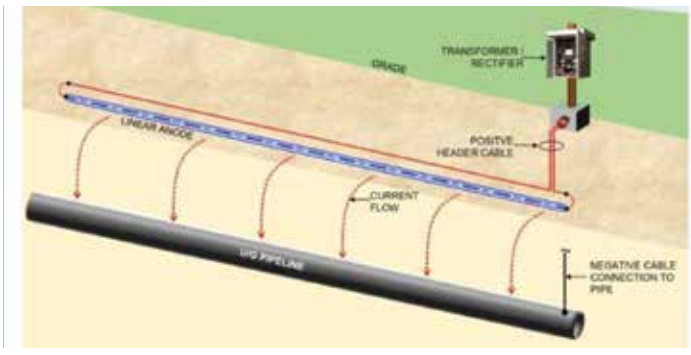

Figure 2: UG Pipeline CP System with Single Linear Anode Layout.

Backfilled Linear Anode

The MMO based anode represents the second generation of backfilled linear anodes. The platinum based catalytic anodes were quickly replaced with MMO based wire anodes as they were more cost effective, less prone to failure, allowed for a longer anode system life and a larger range of current outputs, and provided a far more robust material.

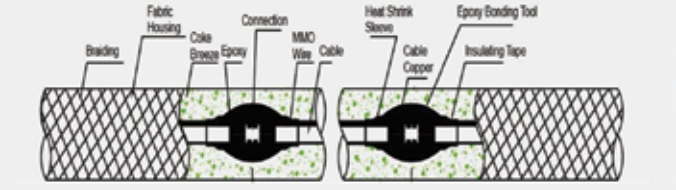

Figure3: MMO Linear Anode Composition.

Below are the key elements that contribute to the MMO linear anode composition ,

- Core, is crafted from high-quality titanium wire. This core is meticulously coated with a catalyst blend derived from Mixed Metal Oxides, predominantly featuring Iridium and Tantalum oxides.
- MMO Coating, on one hand incorporates an electrocatalytic conductive element, which acts as a catalyst to drive the essential reactions for current generation. On the other, it embeds bulk oxides that serve as a protective shield, ensuring the substrate material remains resistant to corrosion.
- Acid Resistance Fabric, this fabric is designed to provide an additional layer of protection against acidic environments. Its unique composition ensures that the MMO linear anode remains safeguarded from potential corrosive effects of acids, thus enhancing its longevity.
- Protective Braid, surrounding the anode is a protective braid which offers mechanical protection. This robust braid ensures that the anode is shielded from external wear and tear, making it more durable and resilient to external forces.
- Coke Breeze is a common backfill material for ICCP systems. It not only enhances the conductivity of the anode but also aids in distributing the current uniformly. This ensures efficient operation and reduces potential hot spots.

The MMO linear anode functions as a distributed system including an infinite number of continuously spaced anodes. This system offers the optimal technical CP solution while minimising the required current output as detailed below:

- Electrical isolation is not necessary, Because the MMO linear anode is closely located next to the piping being protected, electrical isolation as illustrated in [4] is not a significant concern. The anode is "closely coupled" to the piping and operates with a very low anode gradient that minimises any losses to nearby structures including grounding equipment.
- Maintains uniform current distribution by positioning the anode parallel and in very close proximity to the piping being protected, the linear anode CP system design eliminates any requirement for supplemental anodes to address areas where remote anodes may be shielded after the CP system is commissioned. Wherever the piping goes, the linear anode follows in the same trench. This also makes it very easy to adapt the design during piping revisions that may change the piping system routing as the plant construction proceeds. Sufficient care must be taken during its installation of course.
- Elimination of stray current risks, close proximity to the piping being protected significantly limits current losses to other structures and virtually eliminates shielding and stray current concerns. This also significantly reduces the total current requirements for the system, reducing the rectifier requirements.
- Access restrictions, the MMO linear anode is installed in very close proximity to the piping that is to be protected. This minimises the risk of third-party damage and reduces trenching required for buried cable and drilling required for distributed anodes. If installed in conjunction with the piping, the anode can be placed in the same trench as the piping affording the anode protection by the piping itself from external damage. This is a very cost-effective CP installation when installed concurrently with the piping and to correct spacing.
- Ease of installation, when installed alongside the piping during pipelay a matter of laying the anode cable in the trench with no further drilling is needed.

Case Study

- This section outlines the proposed CP system by linear MMO anodes for new 8" & 6" underground Header and branch underground piping's network in Saudia Arabia. The total length of the gas grid distribution piping network in this instance is 4900m and the piping will be protected by a permanent (ICCP) system for a lifetime of (25 years) according to project specifications by applying a new CP system of 25V/15A rating.
- The MMO Linear Anodes comprise a continuous MMO/Ti wire with copper cable packaged in fabric jacket fulfilled with calcinated coke installed parallel to the pipelines in the same trenches by maintaining a minimum distance of 0.5-0.8m from pipeline.
- A header cable is attached at the factory via a high-pressure crimp connector to ensure a low resistance connection. That connection is then sealed in a splice kit with epoxy resin to prevent water intrusion.
- Finally, the header cable to anode feeder cable connection is performed on site as per the manufacture specification and standard procedures.

Figure 4: Installation of the MMO Linear Anode.

Figure 5: Installation of CP Cables in The Same Trench of the MMO Linear Anode.

The CP system must then be examined to confirm the proper installation of all components. It is crucial to verify the connections and continuity of the positive anode cables. Resistance measurement between various anode feeders is required to ensure electrical continuity, as well as between different main positive cables. The resistance reading should be less than 1 ohm. Sample results of the continuity test are illustrated in the tables below.

Table 1. Anode Feeders Continuity Test Sample.

SN	From	To	Resistance (Ohm)
	Anode	Anode	
1	AF-37	AF-38	0.6
2	AF-38	AF-39	0.7
3	AF-39	AF-40	0.4
4	AF-40	AF-41	0.2
5	AF-41	AF-42	0./3

continues on page 34

Table 2. Main Positive Cables Continuity Test Sample.

SN	From	To	Resistance (Ohm)
	Anode	Anode	
1	AJB-1	AJB-2	0.2
2	AJB-2	AJB-3	0.3
3	AJB-3	AJB-4	0.2

During CP commissioning activities any temporary sacrificial anodes must be disconnected and the piping given 96 hours to depolarise before measuring the native potentials which were found in this instance to lay in the range -410 to -635mV copper/copper sulphate (CSE) with an average of -550mV. Thereafter the permanent CP was commissioned and energised and the piping allowed to polarise for 48 hours at 4.5Volt/2.2Amp setting. ON 'pipe to soil' potentials were measured at all test stations and the Instant-Off pipe to soil potentials were then measured at DC coupon test stations. Both ON & Instant-Off potentials did meet the required CP criteria as specified in Saudia Aramco COMPANY specifications. The records of Native, ON and the Instant-Off pipe to soil potentials are illustrated in the tables below.

Table 3. Native, ON and the Instant-Off Pipe to Soil Potentials at DC Coupon Test Stations.

Location Test Station No	DC Coupon to Cu/CuSo4 Reference Potentials (-V)			
	"Native"	"ON"	"OFF"	Achieve the Protection Criteria
CTS-01	-0.587	-1.641	-0.914	Yes
CTS-02	-0.532	-1.652	-0.938	Yes
CTS-03	-0.527	-1.633	-0.975	Yes
CTS-04	-0.528	-1.636	-0.929	Yes
CTS-05	-0.524	-1.622	-0.994	Yes
CTS-06	-0.499	-1.630	-0.989	Yes
CTS-07	-0.410	-1.659	-0.997	Yes
CTS-08	-0.507	-1.621	-1.038	Yes
CTS-09	-0.554	-1.636	-1.022	Yes
CTS-10	-0.561	-1.645	-1.041	Yes
CTS-11	-0.538	-1.656	-0.956	Yes
CTS-12	-0.534	-1.689	-0.961	Yes

Table 4. Native and ON Pipe to Soil Potentials at Test Stations.

Location Test Station No	DC Coupon to Cu/CuSo4 Reference Potentials (-V)		
	"Native"	"ON"	Achieve the Protection Criteria
CP-TS-01	-0.552	-1.735	Yes
CP-TS-02	-0.578	-1.678	Yes
CP-TS-03	-0.540	-1.725	Yes
CP-TS-04	-0.521	-1.726	Yes
CP-TS-05	-0.550	-1.692	Yes
CP-TS-06	-0.547	-1.652	Yes
CP-TS-07	-0.615	-1.727	Yes
CP-TS-08	-0.523	-1.696	Yes
CP-TS-09	-0.572	-1.772	Yes
CP-TS-10	-0.558	-1.667	Yes
CP-TS-11	-0.573	-1.680	Yes
CP-TS-12	-0.555	-1.645	Yes
CP-TS-14	-0.521	-1.664	Yes
CP-TS-15	-0.601	-1.665	Yes
CP-TS-16	-0.551	-1.660	Yes
CP-TS-17	-0.587	-1.650	Yes
CP-TS-18	-0.578	-1.685	Yes
CP-TS-19	-0.571	-1.667	Yes
CP-TS-20	-0.576	-1.735	Yes
CP-TS-21	-0.604	-1.743	Yes
CP-TS-22	-0.596	-1.748	Yes
CP-TS-23	-0.634	-1.755	Yes
CP-TS-24	-0.634	-1.668	Yes
CP-TS-25	-0.513	-1.715	Yes
CP-TS-26	-0.567	-1.740	Yes
CP-TS-27	-0.521	-1.730	Yes
CP-TS-28	-0.527	-1.736	Yes
CP-TS-29	-0.601	-1.720	Yes
CP-TS-30	-0.588	-1.685	Yes
CP-TS-31	-0.531	-1.726	Yes

Summary

Process equipment reinforced concrete foundations and electrical plant grounding are usually an integral part of the plant. Shielding of underground piping network in congested oil and gas plants is one of the major problems when CP is applied for its protection from external corrosion. Not only is a significant amount of protective current consumed by these elements, but also, they restrict the flow of protective current to the intended structures from a conventional, distributed or remote ground bed. CP of plant piping where current leakage and stray current caused by reinforcement concrete foundations and grounding rods are a real problem.

MMO Linear anodes are a modern solution that can simply be laid alongside a new pipeline and current distribution and polarisation formation are normally better in case of anodes installed close to the pipeline, MMO linear anode is an effective method to protect the plant piping against soil side corrosion.

The utilisation of MMO linear anode for plant piping protection will also lead to a substantial decrease in project installation and maintenance expenses, as well as improved performance in comparison to the traditional method of CP distributed anode. In this particular case study, the approach of Linear MMO anode to be utilised for plant piping protection resulted in revising the initial plan to drill and install 50 distributed anodes. As such, significant cost savings were realised resulting in approximately 3850 meters of cable trenching and 50 drill anodes with total depth of 250 meters were eliminated in addition to avoiding the need for anode bed replacement for an extended period, ranging from 25 to 40+ years, can result in significant cost savings in terms of capital cost.

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A Performance-Based Integrity Approach for Non-ILI Assets Using Contactless Magnetic Inspection Technology (CMIT)

Chukwuma (Chuks) Onuoha, PhD, P.Eng. FICorr.

INSTITUTE OF CORROSION

Meet the Author

Dr Chukwuma (Chuks) Onuoha

Dr Chukwuma (Chuks) Onuoha, P.Eng., PhD is a Principal Corrosion Engineering Lead at **Canchuks Corrosion Inc Canada** specialising in pipeline integrity, corrosion engineering, and advanced inspection technologies. He holds an MSc in Corrosion Control Engineering from the University of Manchester (UK) and a PhD in Materials Engineering (corrosion specialisation) from Dalhousie University (Canada). He has led major integrity programmes including ECDA, ICDA, and SCCDA across complex pipeline systems worldwide. Dr Onuoha has authored over 50 technical papers and actively collaborates with industry research organisations to advance emerging integrity technologies. He is an AMPP Certified Corrosion Specialist and a Fellow of the Institute of Corrosion (ICorr). With more than a decade of hands-on involvement in Contactless Magnetic Inspection Technology (CMIT), he has supported its development, validation, and deployment across multiple continents. His work focuses on improving inspection confidence, reducing uncertainty in integrity decisions, and enhancing the reliability and safety of high-risk pipeline infrastructure.

Author Experience Statement – Contactless Magnetic Inspection Technology (CMIT)

This article is written based on the author's direct personal and professional experience in the research, development, validation, and global deployment of Contactless Magnetic Inspection Technology (CMIT). Dr. Onuoha has been actively involved in CMIT technology development, pilot programs, and full-scale operational deployment for over a decade. During this time, he has supported and led CMIT applications across North America, Europe, Africa, and the Middle East, gaining extensive real-world insight into the technology's capabilities, limitations, and optimal deployment strategies.

Through this work, Dr. Onuoha has personally validated the use of CMIT across multiple integrity applications, including:

- Detection and characterization of internal corrosion, external corrosion, and stress corrosion cracking
- Optimization of excavation programs by refining external corrosion assessment dig prioritization
- Support of pipeline integrity investigations and failure analysis programs
- Evaluation of cased pipeline crossings and complex buried pipeline geometries
- Integrated integrity assessments combining cathodic protection performance, coating condition, and CMIT inspection data
- Detection of corrosion and strain-related anomalies in cathodically protected pipelines with high-shielding dielectric coatings
- Assessment of geohazard-related strain signatures affecting buried pipelines

The technical perspectives presented in this article are grounded in practical field deployments, engineering analysis, and direct technology application across diverse operating environments. As such, the framework and conclusions presented are based not only on theoretical understanding, but on demonstrated operational performance and real-world integrity outcomes.

Deployment of Contactless Magnetic Inspection Technology (CMIT) for the Integrity Assessment of Unpiggable Pipelines

Buried pipelines that cannot be inspected using conventional in-line inspection (ILI) tools, commonly referred to as *unpiggable pipelines*, remain among the most challenging assets to manage within modern pipeline integrity programs. Design limitations, diameter restrictions, flow constraints, operational interruptions, legacy construction features, and economic considerations frequently prevent the deployment of ILI technologies.

Some of the reasons why some buried pipelines cannot be internally inspected (Pigged) include:

- Small Diameter Pipelines
- Non-Piggable Pipeline Geometry
- Absence of Pig Launchers and Receivers
- Diameter Changes (Reducers / Expanders)
- Flow Constraints
- Low Pressure or Intermittent Service
- Internal Restrictions or Obstructions
- Multiphase or Unstable Flow Regimes
- Operational Risk or Inability to Interrupt Service
- Legacy Construction Features
- Economic Constraints
- Product or Service Limitations

Consequently, operators are often required to make critical integrity decisions for ageing, high-consequence assets with limited direct condition data and increased reliance on indirect indicators. In response to these limitations, the industry has traditionally adopted direct assessment (DA) methodologies, specifically, external corrosion direct assessment (ECDA), internal corrosion direct assessment (ICDA), and stress corrosion cracking direct assessment (SCCDA), to manage unpiggable pipelines. While DA frameworks are well established and supported by industry standards, they are fundamentally inferential in nature. They depend heavily on historical records, environmental parameters, system-level indicators, and engineering judgement to infer the presence, severity, and location of integrity threats. This reliance introduces inherent uncertainty, particularly in complex operating environments where multiple degradation mechanisms interact or where geotechnical conditions evolve over time. As regulatory expectations increasingly emphasise performance-based integrity management and defensible, data-driven decision-making, the limitations of direct assessment techniques (especially indirect inspection) have become more pronounced. There is a growing demand for aboveground inspection technologies capable of providing pipeline-specific, inspection-grade condition data without requiring excavation, coating removal, service interruption, or physical contact with the pipe.

Contactless magnetic inspection technology (CMIT) represents a significant advancement in this regard. CMIT is a non-intrusive, indirect,

continues on page 36

above ground inspection technology that assesses the condition of buried ferromagnetic pipelines by measuring localised disturbances in the Earth's naturally occurring magnetic field. These disturbances arise when changes occur in the pipeline's structural or mechanical state, including localised wall-thickness loss, residual or applied stress, plastic deformation, or geometric irregularities. By deploying high-resolution magnetic sensors along the pipeline right-of-way, CMIT captures, quantifies, and interprets these anomalies to provide a direct indication of pipeline integrity without the need for physical access to the asset.

Unlike conventional above-ground survey tools that rely primarily on surrogate indicators, such as coating condition, cathodic protection performance, or soil resistivity, CMIT responds to the *physical manifestation of degradation and deformation within the pipeline steel itself.* This distinction allows CMIT to bridge the gap between indirect assessment and direct inspection, offering actionable integrity intelligence that is both pipeline-specific and engineering-relevant. The non-contact nature of the technology makes it particularly well suited for long-distance pipelines (for instance, over 5 km), environmentally sensitive regions, congested rights-of-way, and high-consequence areas where excavation is disruptive, costly, or impractical.CMIT operates through the continuous measurement of magnetic field deviations relative to the background geomagnetic field. These deviations may originate from a range of integrity threats, including:

- Corrosion-related metal loss, both internal and external,
- Crack-like defects and stress concentration zones associated with progressive stress,
- Corrosion cracking (SCC),
- Weld anomalies and fabrication-related discontinuities,
- Geometric deformations such as dents, wrinkles, buckles, or ovalities,
- Localised strain and deformations resulting from geotechnical activity, including landslides, subsidence, frost heave, or lateral soil movement.

By translating these non-contact magnetic signatures into interpretable engineering indicators, CMIT enables operators to directly identify and prioritise integrity threats that would otherwise remain concealed beneath intact coatings or undisturbed soil. Figure 1 shows CMIT operation in action.

Figure 1: Field Deployment of CMIT.

Strengths of CMIT in Defect Detection

Corrosion Metal Loss Detection

One of the primary strengths of CMIT is its ability to detect corrosion and metal loss. Because magnetic field disturbances are directly influenced by changes in wall thickness, CMIT can identify sites of localised thinning caused by both internal and external corrosion mechanisms. This capability is particularly valuable in scenarios involving disbonded or shielding coatings, where conventional external corrosion assessment techniques (direct current voltage gradient (DCVG), alternating current voltage gradient (ACVG), and cathodic protection close interval survey (CIPS)) cannot provide reliable indications of the pipe-wall condition.

Crack and Stress Corrosion Cracking (SCC) Detection

CMIT also demonstrates sensitivity to stress concentration zones associated with crack initiation and propagation, including SCC. Magnetic distortions arising from localised strain accumulation provide insight into regions that may be susceptible to SCC, offering the potential for earlier identification of high-risk areas compared to traditional surface surveys alone.

Mechanical Threat Identification

In addition to corrosion and cracking, CMIT can identify mechanical integrity threats such as dents, buckles, wrinkles, and ovalities. These features generate characteristic magnetic signatures that can be detected and spatially resolved, allowing operators to assess mechanical damage that may compromise structural integrity or accelerate fatigue and crack growth.

Geohazard Interaction Monitoring

A particularly compelling application of CMIT is in the detection and monitoring of pipeline interactions with geohazards. Geotechnical threats, including landslides, erosion, flooding, frost heaves, thermal expansion, subsidence, and seismic activity, can impose bending, axial strain, and localised deformation on buried pipelines. These mechanical responses induce measurable magnetic field anomalies that CMIT can detect along the pipeline right-of-way, providing an early indication of geohazard-related stress before visible surface damage or failure occurs.

For unpiggable pipelines, the challenge of managing geohazard risk is especially acute. Existing approaches rely largely on localised geotechnical investigations, aerial or satellite monitoring, and selective excavations, each of which may fail to capture subtle subsurface pipeline strain or provide continuous pipeline-specific insight. CMIT addresses this gap by enabling the identification of deformation and strain signatures that are characteristic of pipeline-geohazard interactions, thereby supporting proactive mitigation and risk-informed integrity decision-making.

Figures 2 – 3 show the spatial presentation of prioritised anomalies and identification of a stress concentration zone on a pipeline subjected to a stress-deformed state.

Figure 2: Spatial Presentation of Prioritised Anomalies [1].

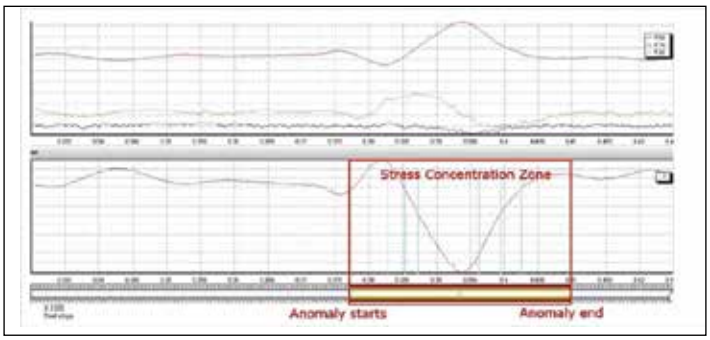

Figure 3: Identification of Stress Concentration Zone on a Pipeline Subjected to a Stress-Deformed State [2].

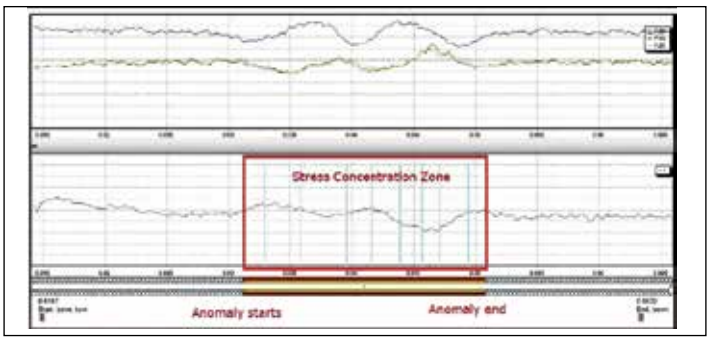

Figure 4: Identification of Stress Concentration Zone on a Pipeline Subjected to a Stress-Deformed State [2].

Integrated Pipeline Integrity Approach with CMIT

Collectively, the integration of CMIT within established DA frameworks represents a decisive shift toward a more evidence-based, performance-driven integrity paradigm for unpiggable pipelines (Figures 5 and 6).

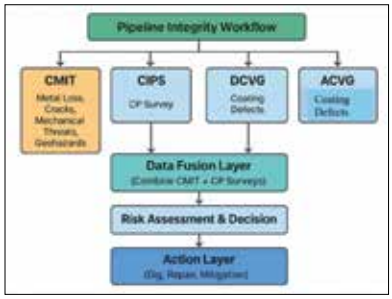

Figure 5: The Synergistic Relationship of CMIT with CP CIPS, DCVG and ACVG in the Integrity Assessment of Unpiggable Pipelines [1, 3].

Figure 6: Integration of CMIT with DA Methodologies [4 - 9].

By delivering inspection-grade, aboveground data that directly reflect corrosion, cracking, mechanical deformation, and geohazard-induced strain, CMIT substantially reduces the uncertainty inherent in ECDA, ICDA, and SCCDA methodologies, transforming predictive assumptions into verifiable engineering insights. CMIT's non-intrusive, repeatable deployment enables efficient assessment across remote, environmentally sensitive, and high-consequence locations without disrupting operations or critical infrastructure, while its geo-referenced outputs seamlessly integrate with GIS, historical DA records, and adjacent ILI datasets.

This convergence of technologies enhances anomaly detection confidence, optimises excavation decisions, and minimises unnecessary digs, ultimately strengthening regulatory defensibility and operational efficiency. As pipeline systems continue to age and regulatory expectations evolve, CMIT-enabled integrity programmes provide operators with a scalable pathway from reactive threat management to predictive, proactive stewardship, thereby extending asset life, reducing risk, and establishing a new benchmark for the modern integrity management of non-ILI assets.

Practical Deployment of CMIT in the Integrity Assessment of Buried Unpiggable Pipelines

Figure 7 presents a recent CMIT case study conducted on a buried 20-inch natural gas pipeline coated with high-density polyethylene (HDPE) tape.

Figure 7 (a): Direct Examination Photos After Coating Removed and Pipe Blasting [1].

Figure 7 (b): Direct Examination Photos [1].

This case study illustrates the practical deployment of CMIT under conditions that are widely recognised across the industry as particularly challenging for conventional integrity assessment methodologies. High-dielectric, shielding coating systems, such as polyethylene tape coatings that are improperly applied or have degraded over time, are known to electrically isolate disbonded regions of the pipeline from the surrounding electrolyte. This electrical isolation can significantly impair the effectiveness of cathodic protection (CP) systems by preventing sufficient protective current from reaching the steel surface beneath the coating. As a result, localised external corrosion may initiate and propagate undetected beneath the disbonded coating, even while CP survey data continue to indicate apparent compliance with established protection criteria. Under such conditions, traditional indirect inspection tools, including CP monitoring, DCVG, and CIPS, are inherently limited in their ability to reliably detect or confirm active corrosion beneath shielding coatings.

CMIT overcomes these limitations by directly sensing magnetic field disturbances associated with changes in pipe wall thickness, stress concentration, and localised deformation from aboveground, without reliance on electrical continuity or direct contact with the pipeline. Because CMIT responds to the physical manifestation of corrosion and stress within the steel itself, it provides a direct and independent means of identifying degradation beneath disbonded or shielding coatings. This capability positions CMIT as a powerful complementary technology to CP-based monitoring and conventional indirect inspection surveys, offering operators an additional layer of confirmation regarding actual pipeline condition.

Case Study 1 demonstrates the effectiveness of CMIT in identifying zones of coating disbondment and active external corrosion that were not evident through routine CP data alone. The CMIT results correlated with subsequent field verification, confirming the presence of external corrosion beneath the HDPE tape coating and validating the reliability of the technology as a diagnostic tool for buried, cathodically protected pipelines. A key advancement illustrated by this case study is CMIT's demonstrated ability to detect external corrosion on pipelines protected by high-shielding dielectric coatings—a long-standing challenge that has historically limited the effectiveness of external corrosion assessment programmes.

For operators managing buried, unpiggable pipelines, particularly those coated with shielding systems, CMIT provides a transformative pathway for identifying external corrosion and SCC threats that would otherwise remain undetected. When integrated within established DA frameworks, CMIT enhances anomaly detection accuracy, improves excavation prioritisation, and strengthens the technical defensibility of integrity decisions. Ultimately, the application of CMIT in these challenging environments contributes to improved pipeline safety, reduced uncertainty in integrity assessments, and a more robust, performance-based approach to managing non-ILI assets.

CMIT Case Study 2: High-Confidence Detection of Complex Defect Clusters in an Unpiggable Crude Oil Pipeline

In a recent field deployment, CMIT demonstrated exceptional accuracy in identifying and characterising a complex cluster of interacting anomalies along a 30-m (100-ft) section of a 10-inch crude oil transmission pipeline. Unlike even the most advanced ILI tools, which rely primarily on geometry-based measurements and physical access, CMIT is a fully contactless magnetic inspection technology capable of detecting both internal and external defects by sensing disturbances in the pipeline's natural magnetic field. These disturbances arise from changes in magnetic permeability caused by corrosion, mechanical damage, deformation, bending strain, and crack precursor activity within the steel microstructure.

From an economic perspective, the cost differential between conventional ILI deployment and non-invasive CMIT inspection can be substantial. For pipelines that are not currently piggable, enabling ILI often requires installation of pig launchers and receivers, system modifications, and operational adjustments. In many cases, pipe pre-clearing activities are also required to remove debris, wax, scale, or deposits to ensure safe and effective tool passage. These activities are typically followed by multiple cleaning runs, gauging runs, and baseline ILI runs before usable integrity data can be obtained. Additional costs may include production impacts, temporary shutdowns, engineering studies, and operational risk management.

When these cumulative costs are considered, total ILI enablement and execution costs can be on the order of magnitude of approximately 20X compared to a baseline non-invasive CMIT inspection cost (1X), particularly for legacy or operationally constrained assets. In contrast, CMIT can be deployed without pipeline modification, product removal, or operational interruption, providing inspection-grade data while significantly reducing cost, schedule, and operational risk exposure.

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Using high-resolution magnetic sensors, CMIT captured a continuous and elevated magnetic response across the full 30-m segment, indicating the presence of multiple interacting degradation mechanisms rather than isolated defects (Figure 8).

Figure 8 (a): Preliminary Sections of Exposed Pipeline Confirming Defects.

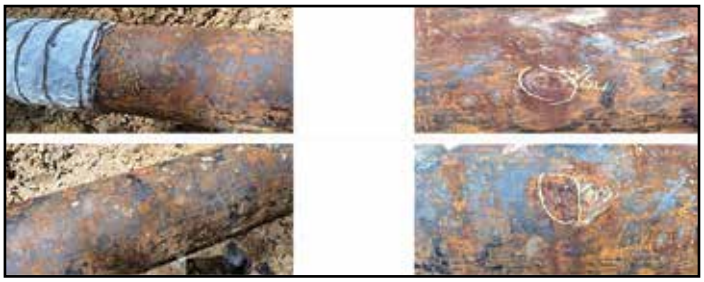

Figure 8 (b): Preliminary Sections of Exposed Pipeline Confirming Defects.

Case Study Outcomes

The technology successfully resolved signatures associated with continuous external corrosion metal loss, localised pitting and wall thinning, mechanical denting, ovality, long-seam strain, and residual stress accumulation. Because CMIT does not depend on piggability, flow conditions, or internal access, it is uniquely suited for operationally constrained or unpiggable pipelines where traditional ILI solutions are not feasible.

Based on the CMIT results, the identified pipeline segment was excavated for direct examination. At the time of reporting, abrasive blasting, surface preparation, and non-destructive examination were still in progress; however, early visual inspections had already confirmed the presence of continuous external corrosion, mechanical deformation, localised bending and strain, and surface features consistent with long-term coating disbondment and underfilm corrosion. These findings directly correlated with the moderate-to-severe CMIT response recorded prior to excavation.

The strong agreement between CMIT data and preliminary field observations validates the technology's sensitivity to complex, multi-mechanism defect clusters and its ability to accurately map defect extent, severity, and interaction. Critically, CMIT enabled the operator to recognise a long, continuous zone of degradation that would not have been identified with comparable confidence using indirect assessment techniques alone. This level of insight is essential for understanding true integrity risk and for making defensible, risk-informed decisions.

Upon completion of a detailed NDE and engineering evaluation, appropriate mitigation measures, including recoating, reinforcement sleeves, localised repairs, stress-relief actions, or section replacement, will be implemented. The high-confidence, pre-excavation intelligence provided by CMIT allows these interventions to be precisely targeted, technically justified, and safety-focused.

In summary, this case study clearly demonstrates CMIT's value as a deployable, inspection-grade solution for the early detection of complex defect clusters, enabling proactive intervention and significantly enhancing the safe and reliable operation of crude oil pipelines.

Conclusions

This study demonstrates that CMIT provides a substantive advancement in the integrity management of unpiggable pipelines by overcoming key limitations of indirect-only assessment approaches. Field-validated case studies confirm CMIT's ability to detect and characterise external corrosion, SCC-related stress concentrations, and complex interacting defect clusters, including degradation occurring beneath high-shielding dielectric coatings. The strong correlation between CMIT responses and direct examination findings validates its sensitivity to defect extent, severity, and interaction, delivering inspection-grade insights beyond conventional DA methods.

When integrated within ECDA, ICDA, and SCCDA frameworks, CMIT reduces uncertainty, improves excavation prioritisation, and strengthens the technical defensibility of integrity decisions.

Collectively, CMIT establishes a deployable, non-intrusive, performance-based solution that enhances pipeline safety, supports proactive mitigation, and sets a new benchmark for the aboveground assessment of non-ILI assets.

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Advancing Subsea Pipeline Corrosion Inspection, Current Capabilities and Future Requirements

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Meet the Author

Neil M Cowin

Neil M Cowin is an experienced Integrity Manager specialising in topsides facilities, pipelines and subsea engineering, with a strong focus on corrosion and HSE management. An innovative thinker with extensive experience delivering strategic, operational and technical integrity services for large-scale offshore and onshore assets. Possesses in-depth expertise in process and operational integrity, inspection, maintenance, corrosion engineering, materials selection and integrity consultancy for pressurised systems, including subsea facilities, pipelines and topsides.

Highly skilled in technical data acquisition for integrity, inspection and maintenance planning, and in the development and consolidation of equipment databases. Demonstrates strong knowledge of inspection policies, procedures, scopes and methodologies, including risk-based inspection systems and written schemes of examination. Acts as Technical Authority for pressure systems and provides specialist input to EPC design reviews. Experienced in CP design and retrofit programmes, defect assessment, fracture mechanics, remaining life assessments and repairs in accordance with API 579, PD 5500 and ASME VIII.

Introduction

Subsea inspection has developed NDE equipment from those techniques developed for the inspection of pipelines and piping for topside oil and gas service. Especially techniques such as automated UT, ACFM, Eddy Current, Pulsed eddy current, radiography, Acoustic Resonance [ART], now CT – radiation scanning Tomography for deepwater pipelines at 3000m water depths even was utilised subsea to some extent. New developing techniques, per thermography and CT tomography, are also now employed to achieve data for inspection of pipelines and have been useful for inspection of bundles for subsea service. These techniques have also been developing to allow inspection of flexibles to some degree of success, and this is ongoing.

The issues have also related to the factor that external coatings are to be removed to allow such inspection for certain techniques especially that for automated UT. This is because UT cannot define defects below insulative coatings and FBE. The power requirements for ultrasound are the main restriction for not allowing signals to be received from the substrate below coatings such as 3 layer or cement clad pipelines with carbon steel ROD reinforcement cages within the cement cladding upon the pipelines.

All techniques have to be developed and managed via a surface vessel and supported by ROV's in the main to allow inspection below water. The depths range but presently inspection can bemanaged up to 250 m depth pipelines for the majority of the techniques and for 'CT-Scanning radiation Topography' the equipment is viable to 3000 m water depth at significant cost. Thus, analysis is called upon to enable definition of the NDE techniques which will lend themselves to allow inspection of pipelines subsea as a screening approach without removal of external coatings and allow inspection of the WET through FBE, 3-layer coatings and also cement clad weight coated pipelines.

It is to be recognised that 80% of pipelines are non piggable and thus ILI as a method for inspection on many occasions is not viable subsea without expensive modifications, e.g. temporary pig traps (subsea or portable constructed on topsides).

Methodology Outlining the Status of Subsea NDE and Further Requirements

The initial trial inspections were based upon NDE techniques as stated surrounding topside and onshore piping inspections. These being based upon ASME section V standards capabilities and API 571.

These were 'UT', ACFM, Eddy Current then moving forwards to Pulsed Eddy Current, Automated UT arrays, Eddy Current arrays, development of a radiography tool then recent periods have witnessed 'CT- radiation Tomography' and also developing Thermography being utilised as a subsea inspection. The other advancements has been 'ART' the Acoustic resonance UT array technology.

It began with use of divers and moved forwards to the use of ROV's and surface vessel management and scope developments. The stated crux is that external coatings mainly have to be removed, which often causes concern. Techniques have advanced with 'ACFM' and 'Eddy Current' and specialistic Pulsed Eddy current and newer developed CT- radiation Tomography which has allowed WT of the pipelines to be assessed without the removal of coatings.

It has to be stated that the goal is to achieve a screening protocol of investigation of subsea pipelines without coatings removal in the long term. The development of 'ACFM' (alternating current field measurement) has been born from its usage with structures inspection for defining flooded members for offshore jackets which is a standard inspection undertaken at defined frequencies with the assistance of ROV's and an inspection vessel. Initial inspections using automated 'UT' again are defined by assessment by RBI across the seabed review of the most likely sites where coatings can be removed in 3m sections to allow a 'UT' array tool to be attached and rotated around the pipeline up to 3 or 5m sections is the normal status.

Pulsed Eddy Current (PEC)

PEC subsea inspection is used to detect and map corrosion and general wall thinning in ferrous metal assets, such as offshore risers, pipelines, and submerged structures.A probe with a coil is placed on the surface of the asset being inspected.

The coil creates a magnetic field that passes through any layers of coating, insulation, or marine growth to the metal component. The current is then quickly shut off, causing a sharp drop in the magnetic field. This sudden change creates eddy currents within the pipe wall. The eddy currents spread inward and decay. The rate at which they decay is measured by the probe. A thinner wall (due to corrosion) will cause the eddy currents to decay faster, while a thicker wall will cause them to decay more slowly. This provides a reliable estimate of the remaining wall thickness.

The benefits and features that make PEC a developing NDE technique for subsea pipelines and structures inspections includes No surface preparation: The technique can penetrate concrete weight coatings, thick insulation, and marine growth, eliminating the need for costly and time-consuming cleaning.

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- Automation and accuracy: Automated systems and array technology enable consistent performance, improved probability of detection, and highly accurate positioning.
- Efficiency: It allows for rapid, quantitative screening and corrosion mapping of large areas without shutting down production.
- Remote deployment: Subsea PEC systems are often mounted on remotely operated vehicles (ROVs) for deep offshore inspections, reducing the need for divers.
- Versatility: The method is effective for a wide range of underwater assets, including pipelines, risers, caissons, and underwater storage tanks.

As an example of pulsed Eddy current underwater probe capabilities. Underwater probes can tackle offshore inspection applications, even through marine growth requiring no surface preparation. The standard underwater PEC probes are watertight to 100m (330 ft) deep and feature a long cable. These probes are operated with the proven PEC system.

The status LEDs embedded in the probes ensure better control and synchronisation of the diver with the topside inspection team. Diver deployed inspectors can scan components as thick as 100 mm (4 in) as well as insulation and marine growth as thick as 300 mm (12 in).

It is understood the critical importance of maintaining the integrity of underwater assets. That's why underwater pulsed eddy current probes are designed and built to the highest standards of quality and reliability. With advancing 'PEC' inspection solutions,' PEC' can detect corrosion and defects in underwater structures quickly and accurately, ensuring the safety and longevity of subsea structures and assets. There are now viable 'PEC' Technologies for the most advanced, effective, and dependable inspection challenges available in underwater environments.

Figure 1: Example of ROV Conducting a PEC NDE Inspection on the External Surface of a Cement Clad Pipeline.

The ACFM (Alternating Current Field Measurement) subsea crawlers offer smart deployment and operation:

Figure 2: Example of ACFM Around a Seam Weld Subsea.

Once the Crawler magnetically attaches to the inspection surface, the ROV releases it. There are 2 rubber caterpillar tracks provide crawler traction and are easily manoeuvrable to steer the crawler over the inspection surface.

- Motorised mechanisms allow the probe to be deployed accurately over the weld to be inspected.
- Can be deployed by ROV or via deck launch
- Can be deployed with ACFM, ART, or PEC
- Has typical inspection speeds of 30mm/s (1.18ins/s), with a multiple pass inspection being 15 mins/m
- Is rated for water depths up to 150m (493ft)
- Can easily manoeuvre on diameters greater than 760mm (30 ins)
- Uses a closed-loop feedback motor control for accurate weld tracking and a uniform scan speed
- Can inspect through paint and other coatings
- Is tolerant of residual marine growth.

Acoustic Resonance - Subsea Operability

Subsea's ART is its patented, ultra-wideband acoustic inspection technology, which offers penetration and measurement capabilities through coatings, exceeding those of existing inspection technologies. In addition to analysing the material resonances (frequency domain), the technology uses time-of-flight measurements (time domain), which provides accurate external geometry measurements for ovality and dents. ART uses a transducer shooting a broadband (multiple frequency) sound signal toward a target such as a pipe wall. The signal duration is sufficiently long to generate oscillations in the target. As the oscillating target continues to be struck by the sound signal, the resonance greatly amplifies the oscillations. The resonating frequencies (frequency domain) are characteristic of the thickness and material of the target. Attaining accurate data with direct measurement of thickness makes it possible to calculate corrosion rates more effectively and cuts down on the number of inspections that are ultimately required.

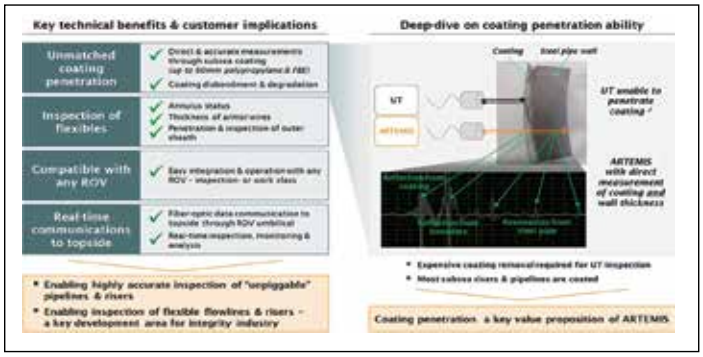


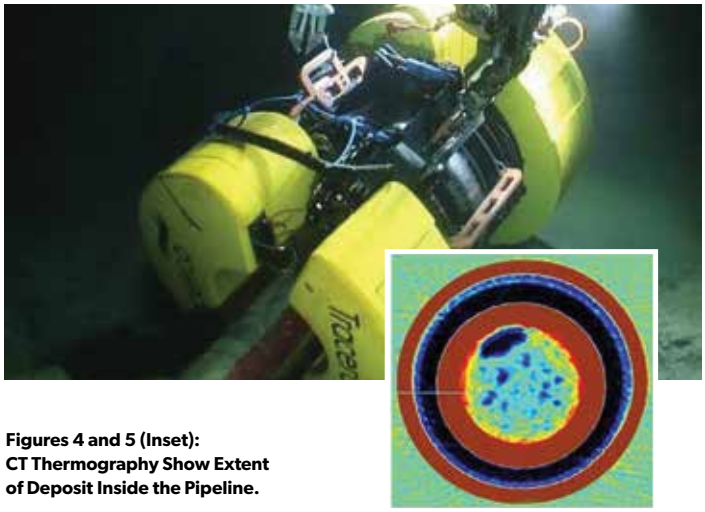
Figure 3: Summary of Proficiency of Acoustic AUT Subsea and Capabilities.

CT – Scanning or Computed Tomography by Radiation Scanning Data.

A major development in deepwater pipeline inspection methodology in recent years has been the integration of subsea CT scanning technology. This enables the delivery of critical flow assurance and integrity data without the need to remove the pipeline's coating. Subsea CT scanning technology offers operators an enhanced understanding of their pipeline, its coating and its process fluids—while allowing the asset to remain fully operational. Using CT technology, an external scan and detailed high-resolution images of the pipe wall can determine precise sizing of wall thicknesses in minutes. Tomographic imaging can identify flaws within a pipe's walls, pinpoint the location, and assess the volume and density of any material or deposits in the pipe.

A major development for the industry has been the introduction of methodologies and technologies that enable the online inspection of piggable and unpiggable deepwater pipes from the outside without the need to remove protective coatings or shut down production. Usually deployed using an ROV on a variety of pipeline designs, advanced deepwater inspection systems can provide insights on both internal and external corrosion, detect blockages and ascertain flow issues. They offer the industry a solution for pipelines that simply cannot be inspected by traditional means and can avoid intrusion and loss of production while providing a significant reduction in campaign costs.

An example is given below of the CT radiation tomography scanner developed by the vendor for up to 3000 m operations depth, thus 10,000 ft capabilities for placement onto a pipeline and viability through coatings for developing pictures through the cross section noted below. Deployed by ROV and operated by umbilicals for power supply.



Figures 4 and 5 (Inset): CT Thermography Show Extent of Deposit Inside the Pipeline.

This subsea pipeline inspection system was designed to deliver accurate material results and distinguish between wax, sand, hydrate, asphaltene or scale deposition within a density differential as low as 0.03 g/cm3. By gathering real-time data on a variety of pipeline integrity issues, including pipeline corrosion, erosion, pitting and wall thinning, modern inspection technologies enable operators to effectively determine the length of time a pipeline can be extended past its original design life. This can help eliminate the operating costs associated with designing a new section of pipeline, recommissioning, pipeline modification, and the time and risks associated with coating removal/reapplication and long and expensive vessel hire.The introduction of advanced fast screening technology can reduce overall scan time by up to 80% in some cases, which means operators can capture more data from a single pipeline inspection to help them improve and enhance the efficiency of existing pipeline models.

Deepwater pipeline inspection systems are often deployed in conjunction with pipeline screening technology to locate blockages in subsea pipelines, which can be many miles in length. Accurately detecting the location of blockages caused by a buildup of deposits is an ongoing issue within pipeline operations. Modern technologies can offer flow assurance screening capabilities to identify areas for further investigation and are often deployed as a pre-cursor to the pipeline inspection system. Advanced screening technologies, such as CT Radiation tomography, allow the rapid screening of pipelines for content and deposit buildup and can provide the capability to screen several kilometres of line at typical speeds of up to 100m per hour without interruption to production. Non-intrusive with no requirement for pipeline preparations, these technologies can measure flow assurance from the outside of the pipeline, avoiding the need to remove protective coatings. The most advanced screening systems are capable of being deployed at depths of up to 3,000m (10,000 ft) and have been deployed to inspect a wide range of pipe diameters and systems including rigid coated or uncoated pipe, pipe-in-pipe, bundles and flexibles. They can provide a detailed pipeline profile by identifying the mean densities of contents and the volume of material based on measured densities, detecting the location of deposit buildup, measuring the density profile of the pipeline, and analysing any detected anomalies. Once the screening system has located any suspected blockage, the Discovery inspection system can be deployed to accurately characterize the precise type and scope.

Corrosion Types and Threats in Coated Pipelines

Coating Types

- 3-Layer Systems + Cathodic Protection (CP)
- Cement Cladding
- Fusion-Bonded Epoxy (FBE)
- Primary Corrosion Drivers:
- Produced water retention (with CO_2, H_2S, scales, and deposits)

Corrosion Threats

Exacerbation by CO_2, H_2S, and chloride salts.

Microbiologically Influenced Corrosion (MIC): Anaerobic bacteria in risers insulated for waxy crudes Vapor-phase & condensation effects

Integrity Risks

- Cracking risk in 40 c –120 °C temperature range
- Damage to outer coatings → ingress of water/salts
- High corrosion rates observed on carbon steel (CS) and alloy pipelines and 316L ,plus martensitic and 400 series Cr alloys
- Reduced CP protection effectiveness

Inspection History

- Alloy pipeline threats not fully assessed for SCC/CSCC under coatings and insulation
- Early inspections limited (partial UT with sampling boxes in the 1980s–1990s; partial ROV coverage)

Pipelines coated to FBE specs before cement/3-layer systems

NDT Strategies for Non-piggable Pipelines

Objective: Inspect 40-year-old coated subsea lines where pigging is not feasible. Scope: Pipelines, risers, flexibles, bundles

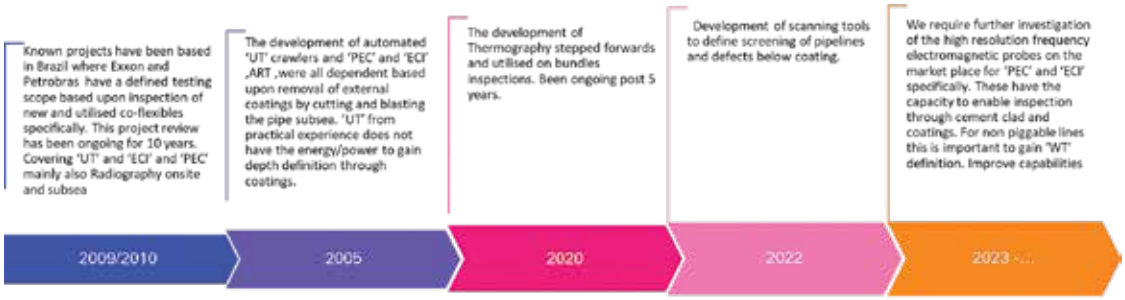
Prioritisation

- Focus on insulated systems (dew point, wax control)
- High-risk streams first (gas & HC production)
- Then secondary streams & utilities

Available NDE Techniques

Automated UT arrays by subsea collars – The external coatings have to be removed for UT automated arrays to be operable.

- Pulsed Eddy Current (PEC) – wall loss through coatings, average 250m water depths are viable.
- Guided Wave UT (LRUT) – long-range screening, coatings have to be removed for access of the array collet to the substrate.
- ACFM – crack detection at welds, ROV-deployable, 150m water depths and viable for deeper depths.
- EMAT – corrosion under supports, no NDT couplant needed
- CT- Radiation Topography- deepwater use up to 3000m depth is viable through coatings.
- CP Surveys by ROV inspection vessels – voltage potentials & potential gradients to assess external pipeline coating and anode condition and longevity.
- Flexibles & Bundles: Annulus testing to 30 m depth maximum, fatigue/curvature monitoring over the arch buoys for structural integrity in water depths up to 150m.
- Process Data Correlation: Inhibitor performance, water cut, salts, Fe counts, bacteria.



Case Histories

Figure 6: NDT Development Summary.

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General Guidance and API Standards

Recommended guidance includes:

A Guideline framework for the integrity assessment of offshore pipelines. DNV Technical Report number 44811520 was part of regulator - HSE KP 3 key performance, type 3 assessment circa 2009 onwards. Especially for Riser integrity management and inspections refer DNV-RP-206.

The CRUX of the matter is to design out the threats by 'process review' and replace by inspection equipment especially deepwater subsea production to ensure internal pigging requirements. API 571-Damage mechanism affecting fixed equipment It covers 'NDE' and specifications. Technically it does cover onshore facilities more so than offshore.

Way Forwards

It is important to develop a progressive R&D program for screening subsea, coated, non-piggable pipelines.

Discussion

Some key outcomes in these processes to date have been:

- Assessment by a topography review of the seabed profile did not always define defects present. For non- piggable pipelines it has proved verys difficult to satisfy all requirements.
- Design basis has generally been to rely on internal inhibition and coatings and core 'CP' for protection.
- Flexibles have been difficult to inspect effectively, due to polymer sheaths. Focus has been on cracking of armour wires. Assessment of flooding of the annular gap is was achieved via a defined vacuum test period inspection technique in standards (note max 30 m depth viability below water).
- Latterly CT-Tomography and recently subsea Thermography has been more valued, as has 'ACFM', 'ECI' and 'PEC' because of its capabilities through % coatings. It has advanced even further since.
- Subsea engineers and integrity managers have Utilised 'ECI' and 'UT' crawlers but removed % coatings from pipelines in majority of cases to obtain a % inspection.
- The 'NDE' focus over the last 20 years has been partially reliable.

As the oil and gas industry considers exposure to more challenging and deeper environments, the continuous development of innovative technology will be essential in supporting performance improvements. As exploration and production go deeper, pipelines will likely have to overcome even greater issues than at present when it comes to integrity and flow assurance. Being able to scan and inspect these assets as accurately and as quickly as possible while allowing production to continue will enable operators to make critical informed decisions, safely and efficiently. Great strides have been made in the screening and inspection of deepwater pipelines, making what may have once been regarded as impossible now possible. However, the industry must continue to push the boundaries of products and services in the pipeline inspection sector to solve the seemingly impossible problems of the future.

Develop 'NDE' Technology for screening the 'WT' below the external of subsea coated pipelinesesepcially cement coated pipelines.

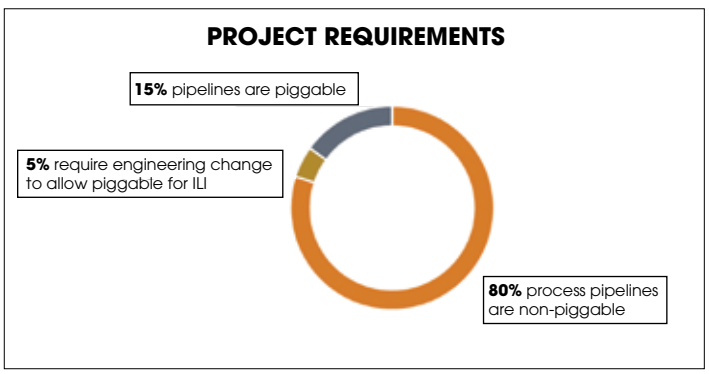

Figure 7: Project Consideration's.

Conclusions

Subsea Inspection of Non-Piggable Pipelines: Key Challenges & Future Needs: The development of integrity for subsea pipelines external inspection and especially Risers to facilities are core Major threat for gas leaks or oil leaks within the North Sea (onshore & offshore) and other international zones. Developing techniques for NDE have been derived from what is traditional corrosion management inspection techniques from API 571 approach. These techniques noted AUT, Eddy current, PEC and ACFM were utilised on subsea structures for assessment of corrosion and flooded member detection. They were also extensively utilised for inspection of caissons for utilities (sea water lift for fire mains water for deluge) and injection of disposal water. 40 years of data gained mainly by the removal of coatings subsea and inspection by UT arrays or other techniques such as Eddy Current PEC, even percentage of radiography has often been the best solution' noting that:

- Current practice: is to remove circa 3m to 5 m width bands of external coating in low-lying areas, analyse WT% by NDE mainly automated UT arrays.
- This principally has been applied mainly to 6"–10" flowlines size ranges especially in the Gulf waters.
- Thus, the weight coated pipelines of Cement cladding up to 150mm (5.9") thick has created challenges.

The noted subsea Failures have been linked to process variations, material selection, and limited NDE capability subsea and also requirements for a screening approach for pipelines coated with 3 layers (polyethylene, polypropylene, PVC and FBE) or more so cement clad pipelines.

Future Needs

Industry requirements continue to develop at a rapid pace.

- Advanced 'CT-Topography', Thermography & 'ACFM' (beyond welds) have the current viable capabilities for subsea equipment enclosures for 3000 m water depths subsea.
- Automated NDE for thicker coatings is a real focus for inspections subsea both for the depths noted and deeper pipelines projects without external coatings removal especially cement clad weight coated pipelines.
- High frequency 'PEC' pulsed eddy current & 'ECI' Eddy Current probes, to enable definition and higher accuracy for pipeline 'WT' below cement especially and coatings. Also to develop subsea equipment enclosures for PEC and ACFM to equally deepwater depths presently 250 m operability and require developed to 3000 m (10,000 ft) water depths.
- Need to explore the viability of Electro-Magnetic Resonance (EMR) for subsea inspections of external coated pipelines as a screening tool to analyse pipeline 'WT'.

It is ongoing techniques such as Electromagnetics and acoustic resonance and 'ACFM' that will require to be advancing with vendors and technologists in the 'NDE' forum and certainly the subsea engineering forum can supply these advancements to the required pipelines and structures to enable a higher definition of screening NDE equipment subsea for the oil and gas industry to enhance and ensure reliability and integrity of pipelines and structures.

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9. Presentations and technical details from NDE suppliers within the industry.
10. Technical knowledge of subsea NDE scopes gained over 35 years.

Internal Corrosion and Biofouling -Driven Degradation in Marine Condenser Vent Piping: A Technical Case Review

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Dr Vijesh Vijayan is an accomplished coatings and corrosion inspection and application specialist with over 15 years of expertise in protective and marine coatings, underwater coating inspection, tank linings, thermal spray aluminium (TSA), intumescent fireproofing, and galvanising. He holds a PhD in Corrosion Engineering and multiple international certifications, including PMP®, NACE Senior Corrosion Technologist, AMPP Protective Coating Specialist (PCS), FROSIO Level III (Red) AGA Hot-Dip Galvanising Inspector, ISO 9001:2015 QMS Lead Auditor, and Master of Yachts 200 Tons. Currently, Dr Vijesh is the Managing Director of The Anti Corrosion Experts FZ LLC, a leading third-party inspection and consultancy firm specialising in corrosion and coating solutions for offshore, onshore, and EPC projects. He also serves as a senior coatings and corrosion consultant, supporting oil and gas operators, paint manufacturers, ship owners and shipyards. His responsibilities include independent coating inspections, specification review, QA/QC audits, technical consultancy, and training, ensuring strict compliance with NORSOK, ISO, ASTM, SSPC/NACE, and other international standards.

1. Introduction

Surface condensers are vital to marine steam-cycle operation, supporting turbine vacuum performance and condensate recovery. Their auxiliary components, however, often operate under mixed-phase, moisture-retaining conditions that are not routinely monitored. The vent pipe is one such component. Its primary function is to evacuate non-condensable gases from the condenser shell, preserving vacuum quality and preventing efficiency losses.

Despite its size, the vent pipe experiences a demanding environment. Steam air mixtures cool rapidly within the line, producing intermittent condensate formation. During low-load operation, condensate accumulation is more likely, allowing stagnant moisture to remain in contact with carbon steel surfaces. If seawater vapour or entrained marine organisms enter the system through leakage or inadequate filtration, the internal environment becomes increasingly favorable to localised corrosion and MIC. These processes may progress undetected until significant wall loss or perforation occurs.

The failure examined in this article was identified during routine shipyard maintenance. A section of the vent pipe was removed for examination after external abnormalities were noticed. Internal inspection revealed complex patterns of corrosion and biological settlement. The findings underscore the importance of understanding how moisture retention, deposit formation, and microbial activity interact to produce accelerated internal degradation in marine vessels.

2. Operating Function and Environmental Conditions of the Vent Pipe

2.1 Role in Removing Non-Condensable

Non-condensable gases such as air and carbon dioxide reduce condenser efficiency by forming insulating layers on heat-transfer surfaces. Their removal depends on the performance of the vent system.

The mass of gas discharged can be estimated using the ideal gas relationship:

$$\dot{m} = \frac{P \times V}{R \times T}$$

Where $\dot{m}$ is the mass flow rate of non-condensables, P is absolute pressure, V is gas volume, R is the specific gas constant, and T is absolute temperature.

For example, 0.1 m³ of air at 15 kPa and 40°C yields:

$$\dot{m} \approx 0.165 \text{ kg}$$

Although this mass is small, the presence of non-condensable significantly affects vacuum stability. Any fouling or corrosion within the vent line that restricts flow can impair condenser performance.

2.2 Moisture Retention and Corrosive Exposure

The vent pipe interior is subject to:

- continuous or intermittent wetting
- stagnation during reduced steam flow
- condensation containing trace chloride species
- organic and inorganic debris
- variable oxygen availability

A key predictor of corrosion is the time-of-wetness (TOW):

$$TOW = \frac{t_w}{t_{total}}$$

Where t_w represents time the surface remains wet, and t_{total} is the total exposure time. Marine systems frequently exhibit TOW values above 0.6, indicating high corrosion susceptibility. In vent systems with inadequate drainage, TOW approaches unity, enabling persistent localized attack and supporting microbial colonisation.

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3. Component Description and Service Conditions

The component analysed was a carbon steel vent pipe, likely conforming to ASTM A106 Grade B, with an original wall thickness of approximately 3.0 mm. The line had operated for several years without internal cleaning or inspection. No internal coating was applied, and the pipe's geometry allowed condensate pooling at specific locations.

During shipyard maintenance, the removed section was found heavily fouled with marine organisms and corrosion products. Post-cleaning UT measurements revealed minimum remaining thicknesses as low as 0.8 mm. This indicated pronounced localised thinning consistent with pitting and MIC.

The absence of internal protection, combined with intermittent flow and poor drainage, created favourable conditions for corrosion initiation and propagation. The presence of barnacles and biofilms suggested that seawater entrainment and inadequate filtration played a role in introducing biological contaminants.

4. Observations and Corrosion Morphology

The internal surface showed a clear transition between regions affected only by general corrosion and zones heavily colonised by marine organisms. This provided a direct comparison of corrosion behaviour under different microenvironments.

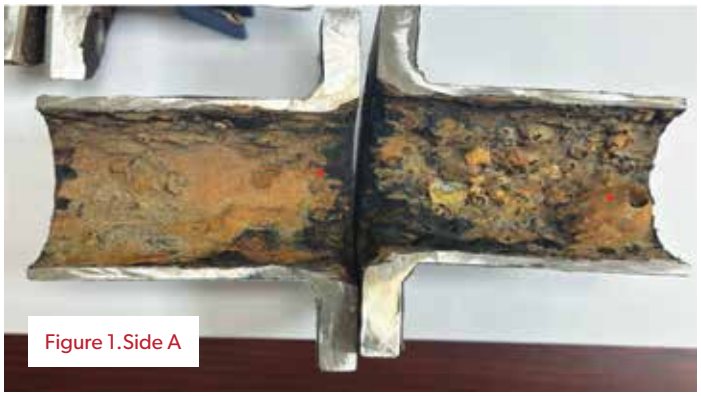

Figure 1: General Oxidation in Non-Fouled Areas.

Non-fouled areas exhibited uniform reddish-brown corrosion and darker patches of magnetite, typical of oxygen-limited wet-dry cycling.

Figure 2: Barnacle Colonisation and Calcareous Deposits.

Barnacle bases strongly adhered to the steel surface, forming rigid crevice-like structures. These deposits retained moistur and created localized oxygen differentials that promoted under-deposit attack.

Pits were sharp-walled and deep, often containing black corrosion products associated with MIC, such as iron sulfide

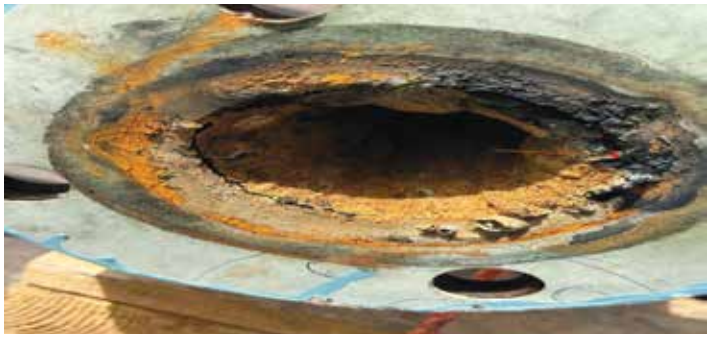

Figure 3: Deep Pitting Beneath Biofilm Layers.

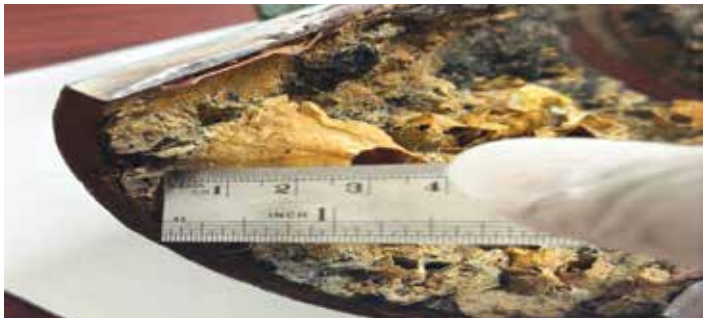

Figure 4: Overhead Barnacle-Rich Cross-Section.

The cross-section revealed crater-like features, discolouration, and rough morphology consistent with biofouling-enhanced corrosion. Collectively, the visual evidence pointed toward a multi-mechanistic degradation process in which biological and chemical factors worked synergistically.

5. UT Thickness Mapping and Metal Loss Assessment

UT inspection performed after mechanical cleaning provided quantitative insight into the extent of degradation:

Location	Condition	Remaining Thickness (mm)	Wall Loss (%)
A1	Corroded but unfouled	1.9	36.7%
B1	Beneath barnacle	1.2	60.0%
B2	Pit crater centre	0.8	73.3%
B3	Biofilm margin	0.9	70.0%

To estimate the localised corrosion rate:

$$\text{Pitting Rate} = \frac{t_{initial} - t_{remaining}}{\text{service years}}$$
$$= \frac{3.0 - 0.8}{3} = 0.73 \text{ mm/year}$$

This rate exceeds typical uniform corrosion rates by an order of magnitude, consistent with MIC and under-deposit corrosion.

6. Corrosion Mechanisms Contributing to Failure

6.1 Uniform Corrosione

General corrosion occurred in areas exposed to oxygenated condensate. Although slower than localized mechanisms, uniform thinning contributed to overall section loss.

6.2 Pitting Corrosion

Pitting initiated beneath deposits where chloride concentration, acidic by-products, and microbial metabolites created aggressive microenvironments. The morphology indicated rapid growth once pits were established.

6.3 Crevice Corrosion

Flange interfaces and barnacle bases acted as natural crevices. Differential aeration accelerated anodic dissolution internal to the crevice.

6.4 Microbiologically Influenced Corrosion (MIC)

Several features—blackened deposits, sulphide films, and pit morphology—suggested MIC driven by sulfate-reducing bacteria (SRB). The fundamental reaction:

$$Fe + H_2S \rightarrow FeS + H_2$$

produces iron sulfide films, contributing to aggressive localised attack.

6.5 Biofouling-Assisted Corrosion)

Barnacles and biofilms created semi-sealed microenvironments that impeded oxygen transport, trapped nutrients, and supported anaerobic microbial communities. Their role as long-term moisture traps amplified both pitting corrosion and MIC.

7. Discussion of Interacting Environmental Factors

The corrosion patterns indicated strong dependence on biological presence. Areas without barnacle attachment exhibited moderate general corrosion, while fouled areas suffered severe pitting and MIC. This contrast highlights the influence of biological settlement on corrosion kinetics.

Three primary stages of degradation were identified:

1. **Ingress and survival of larvae and microorganisms** due to insufficient seawater filtration.
2. **Settlement and colonisation within stagnant condensate,** especially during low-load operation.
3. **Establishment of anaerobic niches beneath deposits**, supporting MIC propagation and high pitting rates.

Additionally, wet-dry cycling intensified oxidation reactions. As the vent pipe sits near the condenser top, surfaces frequently transition between condensation and drying, accelerating corrosion.

8. Summary Assessment

The combined evidence supports the following deterioration mechanisms:

- High time-of-wetness due to stagnant condensate
- No internal coating to protect carbon steel surfaces
- Introduction of biological organisms via process contamination
- Formation of barnacle bases and biofilms acting as corrosion incubators
- MIC accelerating localised attack
- Crevice geometries amplifying differential aeration
- Lack of internal cleaning or inspection opportunities
- Limited drainage due to suboptimal pipe orientation

These factors acted together over the service period, resulting in significant wall thinning and risk of failure.

9. Engineering Recommendations

9.1 Material Upgrade

Consider replacing carbon steel with duplex or super duplex stainless steel for improved resistance to pitting, crevice corrosion, and MIC.

9.2 Internal Protective Coatings

Apply epoxy or fusion-bonded epoxy coatings to reduce moisture retention and inhibit biofilm adhesion.

9.3 Drainage Enhancement

Apply epoxy or fusion-bonded epoxy coatings to reduce moisture retention and inhibit biofilm adhesion.

9.4 Improved Filtration

Upgrade seawater filtration to prevent larvae and particulate ingress.

9.5 Biocide Control

Use automated dosing of oxidising or non-oxidising biocides to manage microbial populations.

9.6 Routine Access and Inspection

Incorporate inspection ports or removable sections to allow periodic internal examination.

10. Conclusion

This case study demonstrates how internal corrosion within vent piping can evolve rapidly when biological and environmental factors align. Barnacle settlement, biofilm growth, stagnant condensate, and MIC collectively produced severe pitting and wall loss exceeding 70 percent.

Without intervention, such degradation can compromise condenser performance and overall vessel integrity. Implementing improved materials, suitable coatings, drainage, filtration, microbial control, and systematic inspections will significantly reduce future risk and enhance reliability of marine steam-cycle systems.

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GMA GARNET (EUROPE) GMBH
Tel: 01606 836223

LAKE CHEMICALS & MATERIALS LTD
Tel: 01527 594630 Email: dean.kenny@lakecm.co.uk

LBBC BASKERVILLE
Tel: 0113 2057423 www.bbcbaskerville.com

LLEWELLYN RYLAND LTD
Tel: 0121 4402284 Email: research@llewellyn-ryland.co.uk

PRESSERV LTD
Tel: 01224 772694 Email: stuart.rennie@presserv.com

SCANGRIT
Tel: 01469 574715 Email: sales@scangrit.co.uk
www.scangrit.co.uk

RECIPROCAL COMPANIES

CEOCOR
Website: www. ceocor.lu

ELSEVIER SCIENCE LTD
Tel: 01865 843000

GALVANISERS ASSOCIATION
Tel 0121 355 8838 Email: Ga@hdg.org.uk

INSTITUTE OF MATERIALS FINISHING (IMF)
Unit 2 The Coutyard, Roman Way, Birmingham B46 1HQ
Contact Helen Wood Email: helen@materialsfinishing.org
Tel: 0121 622 7387 www.materials-finishing.org

OIL & COLOUR CHEMISTS' ASSOCIATION (OCCA)
4th Floor Clayton House, 59 Picadilly, Manchester M1 2AQ
Contact Ann-Marie Etherington Email: admin@occa.org.uk
Tel 0161 257 6488 www.occa.org.uk

MARINE CORROSION FORUM
Website: www. marinecorrosionforum.co.uk

QUALITY CONTROL

ELCOMETER
Tel: +44 (0) 161 371 6000 www.elcometer.com

TRAINING AFFILIATES

ARGYLL RUANE LTD
Email: kristian.hampson@argyllruane.com
Web: www.argyllruane.com

CORRODERE ACADEMY
Tel: 01252 732236 **Web:** www.corrodere.com
Email: andrew@corrodere.com

ICATS / CORREX
(MD - Paul Brooks) **Email:** PBrooksMD@correx.org
Email: correx@icorr.org

Institute Events & Training

DIARY DATES 2026

Latest event details are posted at:
https://www.icorr.org/events/
General enquiries to:
Institute of Corrosion admin@icorr.org

CEOCOR

2nd – 5th June 2026, Rotterdam, Netherlands.
Web: ceocor Email: info@ceocor.lu

EUROCORR

6th – 10th September 2026 in Dublin/Ireland
Web: Eurocorr 2026
Email: gareth.hinds@npl.co.uk

BRANCH EVENTS

16th April, 2026, London Branch
In-Person TWI and London branch joint meeting.
Contact: londonchair@icorr.org

21st-22nd April, 2026, Midlands Branch
Hybrid - AGM + ICorr/EFC- WP15 Joint Symposium.
Email: midlandschair@icorr.org

24th April 2026, Yorkshire and Humber Branch
In Person Technical Talks (CED Day).
Contact: yorkshirechair@icorr.org

28th April 2026, Aberdeen Branch
In Person Technical Talk.
Contact: ABZchair@icorr.org

7th May 2026, London Branch
London branch meeting.
Contact: londonchair@icorr.org

21st May 2026, North-East Branch
In-Person technical evening.
Contact: nechair@icorr.org

26th May 2026, Aberdeen Branch
In-Person technical evening.
Contact: ABZchair@icorr.org

25th June 2026, North-East Branch
In-Person North Engineering Day.
Contact: nechair@icorr.org

30th June 2026, Aberdeen Branch
Online technical meeting.
Contact: ABZchair@icorr.org

25th August 2026, Aberdeen Branch
In-Person technical talks (CAD Day).
Contact: ABZchair@icorr.org

CED

24th April 2026, CED, Yorkshire and Humber Branch
CED Conference 2026 –
Global Corrosion Awareness Day.
Contact: yorkshirechair@icorr.org

YICORR/YEP

30th April 2026, YEP
In Person Event - YEP Session 3.
Contact: youngicorrchair@icorr.org

28th May 2026, YEP
In Person Event - YEP Session 4.
Contact: youngicorrchair@icorr.org

25th June 2026, YEP
In Person Event - YEP Session 5.
Contact: youngicorrchair@icorr.org

COURSES AND EXAMS

Cathodic Protection (CP) Training Scheme

Buried Level 1
27th –28th April 2026, Sheffield
26th –27th May 2026, Sheffield
20th –21st July 2026, Sheffield

Buried Level 2
13th –16th April 2026, Telford
11th –14th May 2026, Telford
15th –18th June 2026, Sheffield

Buried Level 3
9th –12th March 2026, Telford
29th June – 2nd July 2026, Sheffield

Concrete Level 1
6th –7th May 2026, Telford

Concrete Level 2
20th –23rd April 2026, Telford

Concrete Level 3
1st–4th June 2026, Telford

Marine Level 2
6th–9th July 2026, Telford

Marine Level 3
8th–11th June 2026, Telford

EXAMS

All based at Northampton HQ

CP Level 4, 4th June 2026
CP Level 4, 10th September 2026
CP Level 4, 26th November 2026

ETGB

Supports ICorr membership, Chartership and CPD requirements, offering a comprehensive range of courses at its Northampton HQ Training Centre and now globally through its supporting partners.

BSSA

Boiler Corrosion
13TH May 2026, Birmingham

Corrosion Mechanisms in Stainless Steels
22nd April 2026, Birmingham
8th October 2026, Birmingham

Fundamentals of Corrosion for Engineers (FOCE)
14th - 18th September 2026, Northampton HQ

Microbiological Induced Corrosion (MIC)
12th - 16th October 2026, Northampton HQ

STGB

Other than final certification, these courses are operated and administered by our two approved Training Partners – Argyll Ruane and Corrodere.

ARGYLL RUANE

Protective Coatings Inspector Level 1
18th – 25th May (Sheffield)
22nd – 29th June (Dunfermline)
13th – 20th July (Sheffield)

Protective Coatings Inspector Level 2
8th – 15th June (Sheffield)

Protective Coatings Inspector Level 3
6th – 10th July2026 (Sheffield)

- **Hot Dip Galvanising Inspector Level 2**
- **Insulation Inspector Level 2**
- **Passive Fire Protection (PFP) Coating Inspector (Cementitious) Level 2**
- **Passive Fire Protection (PFP) Coating Inspector (Epoxy) Level 2**
- **ICorr Recertification Programme**
- **Transition to ICorr Programme**

All above available Online. Sign up anytime. Refer: Coatings & Corrosion Inspection Training Courses and https://argyllruane.com/ and AR_Training_Calendar_2026-19-01-26-01.pdf

corrodere academy

ICorr Training Partner Coating Training and Practical Workshops

- **Inspection Level 1**
- **Coating Inspection Level 2**
- **Coating Inspection Level 3**
- **Insulation Inspection Level 2**
- **Pipeline Coating Inspection Level 2**
- **Hot Dip Galvanising Inspection Level 2**
- **Thermal Metal Spraying Inspection Level 2**
- **Transition to ICorr Level 1**
- **Transition to ICorr Level 2**

All above available Online. Sign up anytime. Refer: Corrodere Academy | Accredited Coatings & Corrosion Training Corrodere Academy and Coating Inspection Courses | Corrodere Academy and Corrodere Events Calendar - Corrodere Academy

BRANCH CONTACT DIRECTORY

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